# SCIENTIFIC AMERICAN

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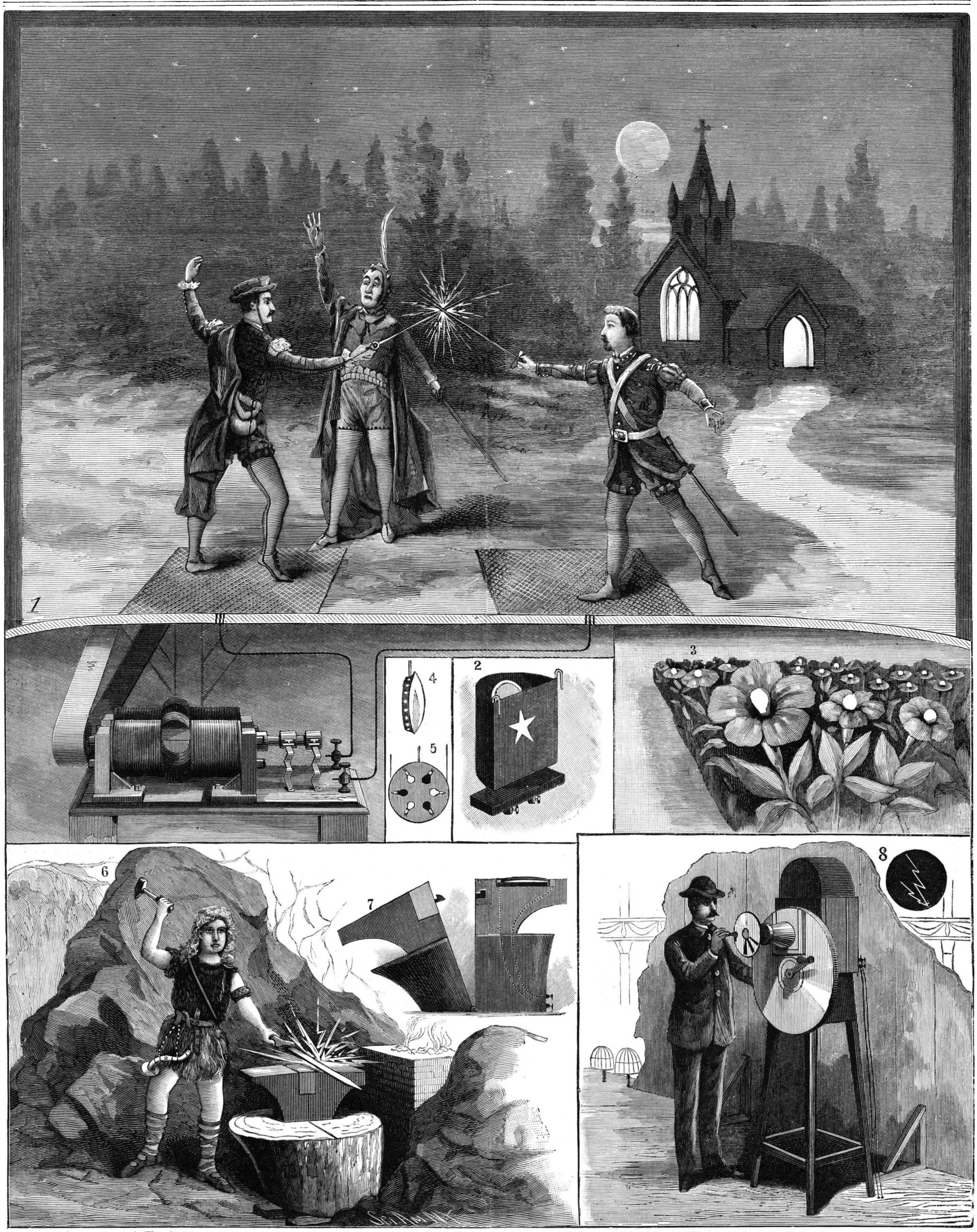


1. The duel in Faust. 2. Electric star. 3. Glowing bed of tulips in Faust. 4. The moon. 5. Moon, showing arrangement of lamps. 6. Siegfried welding the sword. 7. Anvil, showing connections with battery. 8. Stereopticon for producing lightning, rainbow, rain, and sandstorm effects.

**ELECTRICAL AIDS TO THE DRAMA.**—[See page 390.]

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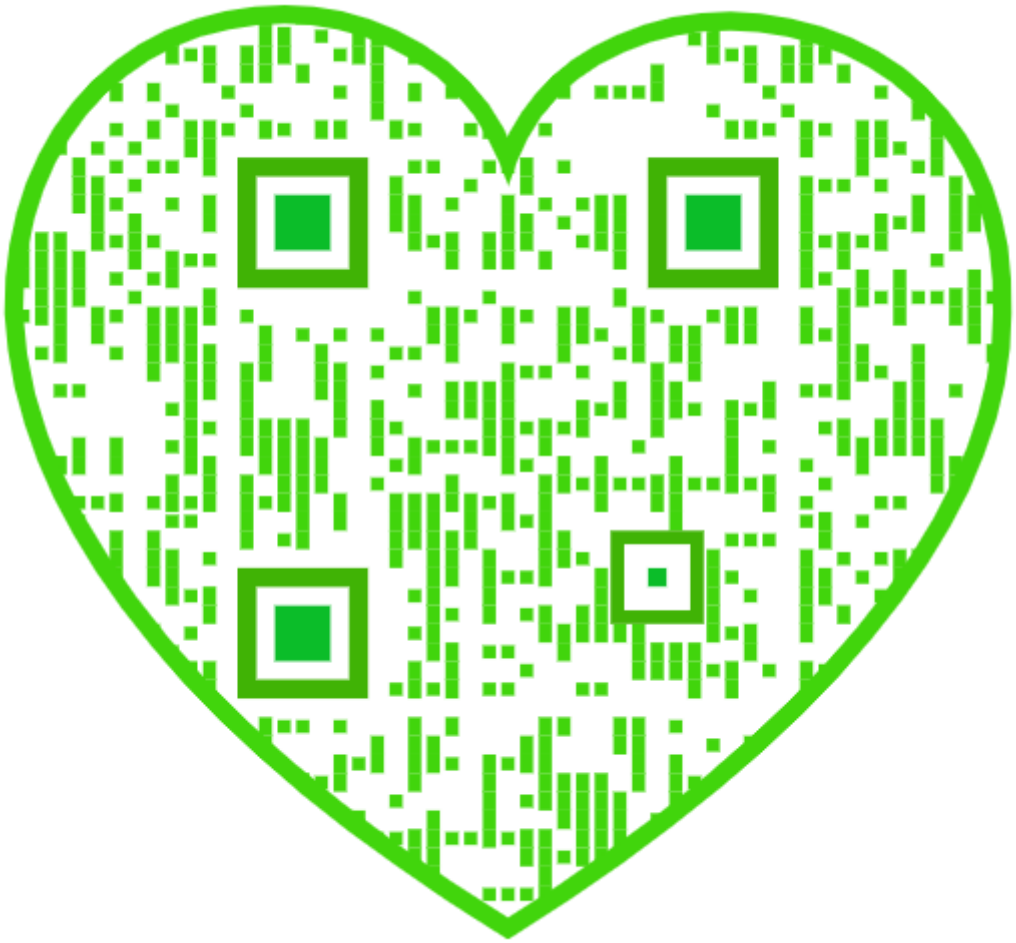

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**Contents.**

(Illustrated articles are marked with an asterisk.)


American Geological Society.... 384
Books and publications, new..... 394
Business and personal..... 394
Coupling, car, Cleveland & Dawson's*..... 386
Decisions of the U. S. Courts.... 388
Drama, electrical aids to*.... 383, 390
Eclipse, total, of January 1, 1889* 385
Electricity, death by, experiments on*..... 393
Enquiries to be answered..... 395
Failure of Panama Canal Co..... 385
Forests of Alaska..... 388
Guns, torpedo, diverging, improved*.....390, 392
Homes for the many*..... 387
House, apartment, new, Brooklyn, N. Y.*..... 387
House, dwelling, an attractive cheap*..... 387
House, Royal E., the electrician* 391
Inventions, agricultural..... 394
Inventions, engineering..... 394
Inventions, index of..... 395
Inventions, miscellaneous..... 394
Lock, safe or vault door, Brown's* 386
Locomotive, "Strong," a new.... 389
Machine, integrating..... 389
Machines, veneering, rotary..... 393
Madness and murder..... 384
Maple, white and sugar..... 389
Milk and typhoid fever..... 384
Mississippi, source of..... 388
Motor, Mr. Keely's ..... 388
Motors, storage battery..... 387
Notes and queries..... 395
Peak, highest in the world..... 389
Periflora Graeca..... 389
Photography, pyrotechnic..... 389
Physics, simple experiments in*. 386
Sassafras, oil of..... 387
Siphon, self-charging*..... 389
Sling, straw, bottom-trip, Wood's* 388
Steam detrimental to sewers..... 385
Stranahan, James S. T..... 392
Swine, healthy, how to have..... 387
Trade, good, to learn..... 393
Walking on the water..... 389


TABLE OF CONTENTS OF

## SCIENTIFIC AMERICAN SUPPLEMENT

## No. 677.

**For the Week Ending December 22, 1888.**

Price 10 cents. For sale by all newsdealers.


PAGE

I. AERONAUTICS.—Improvements in Aerial Navigation.—A recent improvement on a navigable balloon, with notes on other attempts in aerial navigation.—1 illustration ..... 10812

II. ARBORICULTURE.—When and How to Prune Grapevines.—The culture of grapes considered and method of treatment at different periods of growth.—3 illustrations..... 10809

III. ARMS OF WAR.—Reduction of Caliber in Military Rifles.—An elaborate review of the recent pronounced movement in military circles in the direction of changing the caliber of infantry arms, with full formulæ and tabular statement..... 10812

IV. BIOLOGY.—The Salmon Fisheries of the Columbia River.—An abstract of a report to the Secretary of War.—By Major W. A. JONES, U. S. A.—Describing the different Oregon salmon, with illustrations of leading species.—3 illustrations. ..... 10807

V. CHEMISTRY.—Note on Spontaneous Combustion..... 10820
Margosa Oil.—By C. J. H. WARDEN.—An oil extracted from India almonds, an official preparation of the Indian pharmacopœia, its reactions and general properties..... 10809
Saccharine.—By DUJARDIN BEAUMETZ.—A protest against the use of saccharine in articles of food..... 10822

VI. ELECTRICITY.—A Curious Light Effect in Incandescent Lamps.—An exceedingly interesting experiment by which incandescent lamps are made to produce a moonlight effect.—1 illustration.... 10822
Faure's New Secondary Battery.—A new battery utilizing zinc and copper as the opposing elements, an effort to depart from the lead plates hitherto generally used.—1 illustration..... 10814

VII. MECHANICAL ENGINEERING.—Improved Steam Pile Driver.—A new direct-acting steam pile driver, having the ram and cylinder in one.—3 illustrations ..... 10811
Compound Tank Engine, Northeastern Railway.—A recent tank engine built for the Northeastern Railway, of England, with full dimensions of parts.—1 illustration..... 10611

VIII. METALLURGY.—Alloys.—By Prof. W. CHANDLER ROBERTS-AUSTEN.—A third lecture of this celebrated series, with explanations and illustrations of the experiments.—5 illustrations.. ..... 10817

IX. MINERALOGY.—Russian Meteorite at Nowo-Urei.—A meteorite containing carbon in the form of diamond, with analysis..... 10808

X. MISCELLANEOUS.—The Vibratory Law of Progress.—By HORACE C. HOVEY, D.D.—A recent lecture delivered before the Summer School of Christian Philosophy, being a plea against infidelity and an attempt to enunciate a law of progress in nature..... 10820

XI. PHYSICS.—Harcourt's Holophotometer.—A new photometer for measuring the light emitted in every direction by a luminous source.—8 illustrations..... 10820

XII. TECHNOLOGY.—Bunsen Gas Burner.—By C. AUER VON WELSBACH.—An ingenious modification of the Bunsen burner, producing an annular or Argand flame.—8 illustrations.... 10814
Gas from Liquid Fuel.—By C. BROTHERHOOD.—A plant for producing automatically gas from oil or other liquid material.—1 illustration..... 10813
The Jupiter Light.—A new industrial burner arranged to burn heavy oils without loss from spray.—1 illustration..... 10813
The Treatment of Ammoniacal Liquor.—An improved method of extracting sulphate of ammonia gas or tar liquors, with utilization of waste furnace gases.—2 illustrations..... 10814


### THE AMERICAN GEOLOGICAL SOCIETY.

The American Association for the Advancement of Science took its origin in a convention of geologists at Philadelphia, in 1840, who announced the object of that society to be the study of geology and natural history. During the Cambridge meeting, in 1849, a subdivision was effected into four sections—of physics, chemistry, geology, and zoology. There are now eight sections in all; Section E being devoted to geology and geography. The great number of papers offered, and the limited time allowed for their discussion, led the geologists who met at the Cincinnati meeting of the A. A. A. S., in 1881, to consider the propriety of organizing a national society to consist exclusively of working and teaching geologists. The subject was specifically discussed at subsequent meetings, but the consummation was delayed till the Cleveland meeting, last August, when it appeared to the majority present that the hour had come for definite action. There had been a committee for several years having the matter in hand, and Prof. N. H. Winchell and Prof. C. H. Hitchcock, of that committee, called a special meeting of Section E for August 14, the day before that set for the A. A. A. S. There was much enthusiasm and a strong sentiment in favor of the new society. A provisional constitution was adopted, and a committee of organization appointed, consisting of Professors Alexander Winchell, of Ann Arbor, John J. Stevenson, of New York, C. H. Hitchcock, of Hanover, N. H., John R. Proctor, of Frankfort, Ky., and Edward Orton, of Columbus, O. This committee sent circulars to all members of Section E, and also to others whom they had reason to suppose to be interested. The plan was to class the first hundred who should signify their acceptance of the terms of fellowship as "Original Fellows." These have now been found, and other names have been proposed for membership. Ballots have been cast, though not yet declared, for the permanent officers. During the Christmas holidays a meeting will be held at some suitable place, to be designated by the committee, when the organization will be completed, the constitution ratified, and other work done. After the first of January, 1889, all working or teaching geologists in America will be eligible to fellowship on election and the payment of their dues.

It is evident that this is an important movement. Among the original fellows are some of the foremost American geologists. It is not intended in any way to interfere with the American Association for the Advancement of Science. One of its regular meetings will be held at the same time and place as that association.

The call for the first meeting of the American Geological Society has been issued for Thursday, Dec. 27, at Ithaca, N. Y. The formal organization will take place in the Botanical Lecture Room of the Cornell University.

### MADNESS AND MURDER.

The deeds of murder recently done in that noisome quarter of London called Whitechapel, all, there is reason to believe, the work of the same hand, seem to have attracted the attention of the neurologist as well as that of the police. What was the motive? Most people who have followed the history of these crimes, coming as they have one so quickly after another, have laid it to this or that cause, or, at least, it would seem so from those that have been made public. Dr. Hammond, well known in the department of neurology, says, in a recent paper, that no distinct motive was necessary or, rather, that it may have been a mere fancy or freak, such as often comes to those with deranged or diseased minds, or even for the mere love of pain and cruelty—a supposition which the hacking of the body in each case would seem to lead to. There have been nine victims so far, all women, but in the once-celebrated case of Helene Jegado there were twenty-eight in three years, all being killed by poison, and apparently for the pure love of killing and witnessing suffering; in some cases the suffering of those who had befriended her—masters, mistresses, friends, and several nuns. And all the while she affected an ardor of piety—awhile, indeed, an inmate of a convent. Our author declares that a desire "to kill exists, to a greater or lesser extent, in the mind of every human being without exception." Some love to kill game or the lower animals, while others have an irresistible desire to kill their fellows. The mildest mannered man, he says, has it at times, when sufficient cause comes. "It is inborn, instinctive, and no amount of civilization or refinement is sufficient to abolish it altogether." He says that crimes are sometimes done by those to whom the idea of violence is repugnant, whose reason urges them against their own acts, yet with not enough strength to resist the impulse. Neither delusion nor emotional disturbance need come. At one time he is calm, at another excited, but always conscious of his acts. The epileptic may commit acts of violence while under the influence of a paroxysm, unconscious at the time, though remembering every little detail when it is done; but such cases as every neurologist sees, so we are told, have at times an itching for murder. One man, of amiable disposition, asked to be locked up and neglected an extensive business, for the sudden impulse that came to him to commit murder. One, who was continually battling against an impulse to kill his wife, cut off his own right arm. A young man applied for medical relief for cerebral hyperæmia, admitting that with it had come a desire to kill a fellow clerk. So strong it was, indeed, that whenever his back was turned, he could scarce refrain from plunging a knife into him; once offering a cup of poison, and knocking it from his hand when he would put it to his lips. A woman with an impulse to jump from her window only escaped because, as she was preparing to spring out, a market boy slipped on the ice in the street and tumbled about awkwardly, setting the woman laughing and driving the suicidal mood from her.

Such moods, it seems, may recur and may not. A young man could not see a fine dress without the impulse to injure it; running into the nearest drug store for vitriol, and before the mood was gone, ruining over one hundred fine gowns.

The "reasoning" mania would seem, from its description, to be one of the most dangerous, because attacking those from whom acts of violence are not to be looked for. One thus afflicted suddenly finds himself with a perversion of the emotions, derangement of the will; "knowing the impulse is a dangerous one, the act it imposes an unreasonable one." But he must do it, being seized with sanguinary fury. Such persons as are unable to control their impulse to commit crime our author looks upon as in the same category with murderers and as meriting the same fate.

### MILK AND TYPHOID FEVER.

The agency that milk may assume in the propagation of fatal diseases has received much attention during recent years. Dr. Klein's investigations have confirmed the belief that milk has in a large number of cases been responsible for epidemics of scarlet fever.

Tuberculosis, it is also known, can be developed in cows, and can be distributed in like manner by their milk. Much consumption is believed to be due to this origin.

A recent epidemic which occurred in a New Jersey suburb of this city goes far toward reducing the probability of milk acting as a disseminator of typhoid fever to a certainty. A florist had been in the habit of supplying five families with milk. He was attacked by typhoid fever, and after an illness of several weeks expired. It was found that he had been in the habit of drinking large quantities of milk himself, while the other members of his household used very little. Typhoid fever also began to appear among the five families whom he supplied. In each house there were one or more cases. In one family the suspected milk had been used for providing cream for coffee, etc., and the bulk of the fluid, or skim-milk, left had been used for cooking. In this house only one case appeared. Upon inquiry, it was found that the invalid, a domestic, had habitually drunk the skim-milk. The others had not used it and were unaffected. New cases were added to the list, but were all confined to the five families in question and to the florist's house. In one family five or six cases occurred, including one fatal attack.

On investigation the water supply of the milkman's premises was found to be far from satisfactory. He received water from the regular water works. He used a portion of the water pipes within his premises for the conveyance of a liquid fertilizer. This inconceivably unclean practice would offer a good clew to the source of trouble had it been continued. But it is asserted positively that, since last February, no liquid manure had entered the pipes. A well of unquestionably bad water existed on the premises, but does not appear to have been used to any extent. The water supply in the meadow where the cows were pastured was contaminated to some extent with sewage. It is very doubtful if a cow could drink water containing the typhoid poison, and, without becoming ill, could communicate it to her milk. None of the cows has shown signs of sickness. The propagation of the disease by milk is almost absolutely proved in this case. Where the poison or germ came from is altogether uncertain, and the problem has not passed the conjectural stage. If impure water were used for washing the cans, it would afford a satisfactory clew.

The lesson to be drawn from this is clear. Greater precaution in the use of water in dairies should be taken. The mere adulteration of milk is bad as a matter of ethics, but when the addition of water may involve the absolute poisoning of the milk, the responsibility for its addition is far graver. There is also a good side to the question. The occurrence cited in confirming the possibility of milk being the active agent in contagion also indicates a preventable cause. Recent advances in sanitary engineering have gone to prove that much malaria is of house orgin, and the name "house malaria" has been coined to express the condition. In surgical practice Lister introduced the carbolic acid *douche*, and while he supposed that it was disinfection that he was teaching, really taught surgeons to be clean, and many surgical cases now reach a successful end because of cleanliness in the operations. Typhoid fever, in one of its methods of dissemination,

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can be absolutely prevented by attention to the purity of the water supply of dairies. Boiling the milk may also be accepted as an efficacious preventive.

It seems a little remarkable that modern science is finding in the cow an agent of injurious disease after the vaccine virus has been used for so many years as a palliative for smallpox.

### THE TOTAL ECLIPSE OF JANUARY 1, 1889.

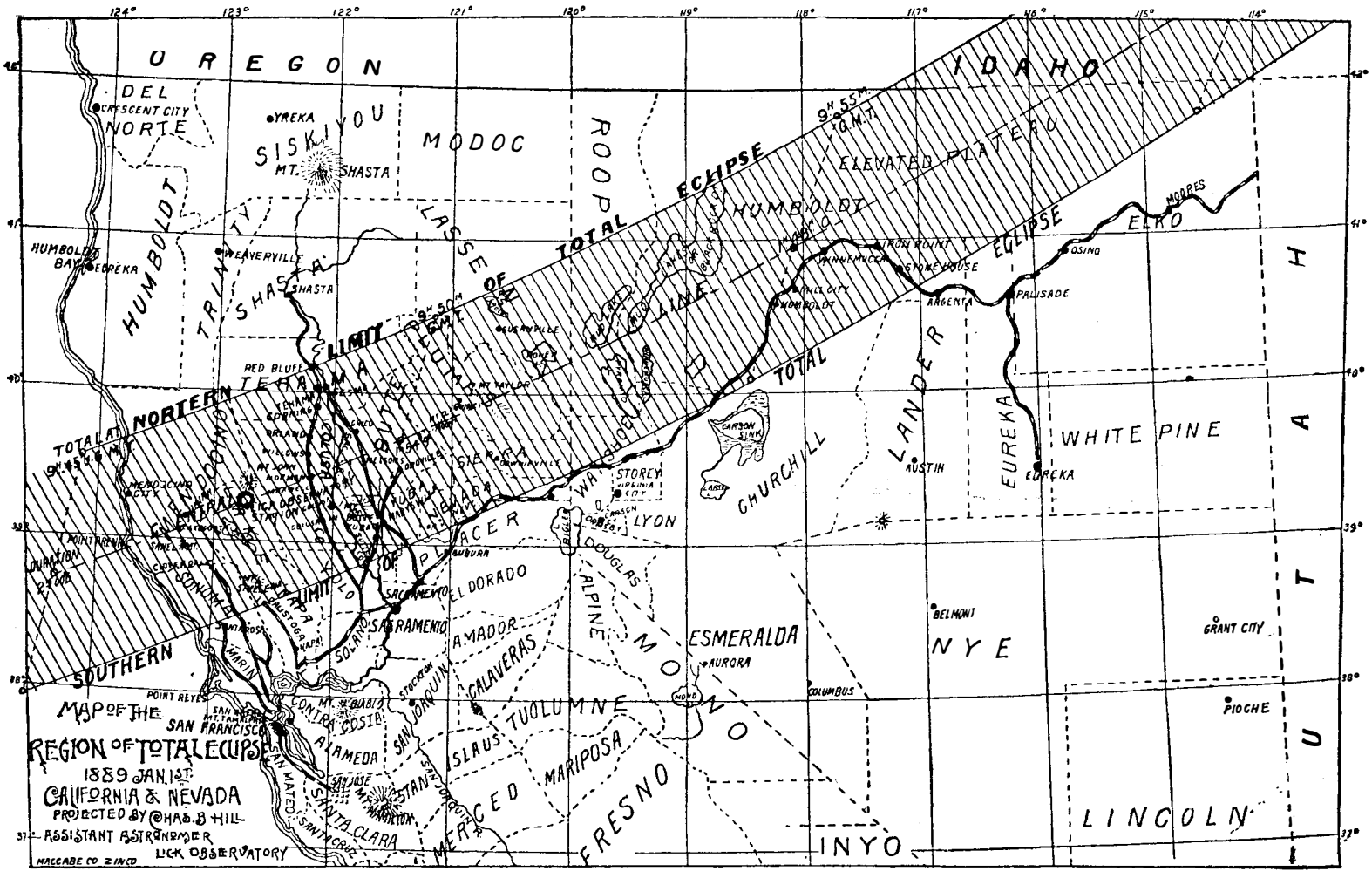
The total solar eclipse of January 1, 1889, visible in this country, will be observed by many American astronomers and possibly some from foreign countries. We present herewith a map of a portion of the path of totality, for which we are indebted to the circular issued by Prof. Holden, of the Lick Observatory, and to the *Sidereal Messenger* for the following particulars: The shadow of the moon will cross the west line of Nevada at the town of Verdi, and its width on the boundary will be 100 miles, the middle of the path being at a point 32 rods north of the 124th mile post of the Central Pacific railway line. The south edge of the shadow will pass about half way between Reno and the highest point of Peavine Mountain. Thus Reno will be just outside the shadow. The center of the path will be about six miles north of Winnemucca and 29½ miles north of Tuscarora. The south edge of the path will pass north of Wadsworth and south of Pyramid, Lovelocks, and Humboldt House. The north edge of the path will pass north of Buffalo Meadows, Willow Point, Paradise Valley, Spring City, Willow Creek, Cornucopia, and White Rock, and will pass ten miles south of Fort McDermitt.

In California, Susanville will be 14½ miles north of the center of the shadow, and Quincy three miles north of it. Nevada City will be thirteen miles north of the south line of the path. All the towns named are inside the shadow path, as are Loyalton, Oneida, Long Valley, Milford, and all the settlements about Honey Lake. All places in or near the center of the path will be in darkness two minutes of time. All those at the edges of the shadow will see the sun momentarily eclipsed. The eclipse will begin at about 1:52 P. M. at Quincy, 1:53 at Honey Lake, and 1:54 at Winnemucca. The shadow travels a northeast course across the State, leaving it at the northeast corner. Mr. Irish very kindly offers to furnish further information concerning localities in the path of the eclipse which observers may desire to know.

The points that may profitably receive observers' attention are:

1. Times of the four contacts and the direction of the line joining the cusps during the partial phases.
2. Search for intra-Mercurial planets.
3. Observation of fringes which show themselves at the beginning of totality.
4. Photometric measurements of the intensity of light at different stages of the eclipse and during totality.
5. Telescopic observations of the details of the prominences and of the corona.
6. Spectroscopic observations of the lower atmosphere of the sun, prominences, and the corona.
7. Observations with the polariscope upon the polarization of the light of the corona.
8. Photography both of the partial phases and of the corona.

The above points are those suggested by Prof. Young in his New Astronomy.




THE ECLIPSE OF THE SUN ON JANUARY 1, 1889—MAP OF THE PATH OF TOTALITY.

### Steam Detrimental to Sewers.

On November 24 General John Newton, late Commissioner of Public Works of New York, in a report to the Mayor spoke of the defects of the sewerage system of the city. One point that was made in the report was of special interest. The evil effects of steam discharged from engine exhaust pipes was emphasized. The suggestions in the report were principally due to Mr. Rudolph Hering. Touching this question of steam, he proposed the use of intercepting traps or cooling basins, or else the discharge of all such steam into the air from pipes reaching above the roofs of the houses.

The admission of steam to sewers not only favors the production of sewer gas, but destroys the material of the sewers. Iron pipe lines, especially at the joints, become seriously weakened; tile pipes lose their hard, ringing character, and crumble away under rapid disintegration. In brick sewers the cement is attacked, and the arch soon becomes little better than a cementless structure. The recent leaks in the pipes of the steam heating company in New York have produced similar troubles, and produced serious annoyances through the streets in which the steam is conducted. The insulation of underground electric lines has been seriously affected, and all who travel upon Broadway can testify to the disagreeable odors produced. It seems clear that the distribution and use of steam should be attended with more restrictions on the part of our city authorities than now apply to it.

### Failure of the Panama Canal Company.

The telegraph brings the announcement of the financial collapse of the Panama Canal Company, due to its failure to negotiate the further sale of its bonds and its inability to meet the now gigantic calls upon it for interest and current expenses. Whether any new arrangements can be made to prosecute and complete the great work is questionable. Strenuous efforts in that direction will undoubtedly be made. The following sketch of the enterprise is given in the New York *Times:*

It was in 1879 that M. De Lesseps first turned his attention to the construction of a canal across the Isthmus of Panama. He was then flushed with the glory of the successful Suez enterprise, and a second attempt of a similar nature was the natural outgrowth of his triumph in the first.

He began his preparation with the earnestness and vigor which have always characterized him. Notwithstanding the fact that he was then nearly seventy-five years old, he undertook a journey to Panama in order personally to explore the proposed route and to negotiate with the local governments. He also undertook to counteract the hostile public opinion in the United States. Active surveys of the isthmus were begun under his direction in January, 1880, and late in February he arrived in New York, and began a tour which extended from Boston to San Francisco, and embraced a trip to Washington, where he had a personal interview with President Hayes and a hearing before a congressional committee. His first estimate of the cost of the canal was 250,000,000f. On his return to France, he declared that his American tour had been successful, and that opinion concerning the scheme had been considerably modified. A preparatory force of engineers and skilled mechanics was sent out from Havre in January, 1881, and work upon the canal was begun soon after its arrival at the isthmus. This work has been prosecuted at intervals, with greater or less vigor, ever since, although the estimates of cost have been greatly increased, and the time for the completion of the canal extended.

The project was the cause of a long and very important correspondence between the British and United States governments, in 1881 and 1882, over the question of an American protectorate, which finally resulted in the practical abrogation of the Clayton-Bulwer treaty. During all this time M. De Lesseps has been the leading spirit in the canal company, and such progress as has been made is the result of his untiring energy and, it must also be said, of his blindness to the practically insurmountable obstacles in his path. It is, indeed, taking a charitable view to assume that he was merely a self-deceived enthusiast, and not a monstrous swindler. In the history of visionary undertakings and financial bubbles there are few things comparable to this old man's canal at Panama. For two years or more it has been a demonstrable fact that he was moving rapidly and with a sure step toward inevitable bankruptcy, and at least one honest journal in France, the *Economiste*, has not concealed the bitter truth from the French people. But they preferred to put their trust in De Lesseps and their savings into his always empty treasury.

He has issued shares and bonds amounting to $400,000,000 at par, and this immense sum in obligations has been taken by the French people, who have probably paid him over $250,000,000 in cash; and the greater part of this has come from the peasantry and small landholders of France. He has resorted to the most unwarrantable financial devices in order to avert the fatal day of bankruptcy, such as issuing new bonds to obtain funds to pay interest on former issues.

The coming bankruptcy of the company has of late been clearly visible, even to many of its former defenders.

THE estimates of the expense of the Post Office Department for 1890 are $66,812,073. The revenues of the department for the fiscal year ending June 30, 1890, are estimated at $62,508,658. This will leave an apparent deficiency for the year ending June 30, 1890, of $4,403,414.

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## SIMPLE EXPERIMENTS IN PHYSICS.

BY GEO. M. HOPKINS.

The value of observation was never more apparent than in the case of the discovery of the action of an electric current upon a magnetic needle by Christian Oersted in 1819. While passing through his laboratory on one occasion, with a compass in his hand, he noticed that the needle acted in a peculiar manner. By a few experiments he ascertained that the disturbance was caused by an electric current flowing through wires strung across his laboratory. To this circumstance we

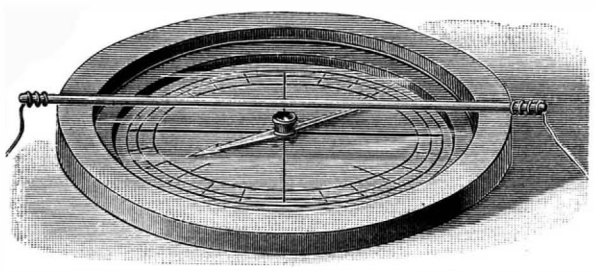


Fig. 1.—COMPASS FOR PROJECTING OERSTED'S EXPERIMENT.

owe the discovery of electro-magnetism. It is shown by experiment that the magnetic needle tends to arrange itself at right angles to a conductor carrying a current.

In Fig. 1 is illustrated a piece of apparatus for demonstrating this fact, either to a few individuals or to a large assemblage, by the aid of a lantern. It consists of a compass with a glass bottom having the scale marked on it. The needle turns on a pivot projecting from a little plate cemented to the center of the glass. When a conductor is laid across the compass, parallel with the needle, and a current is sent through the conductor, the needle is deflected in one direction or the other, depending upon the direction of the current.

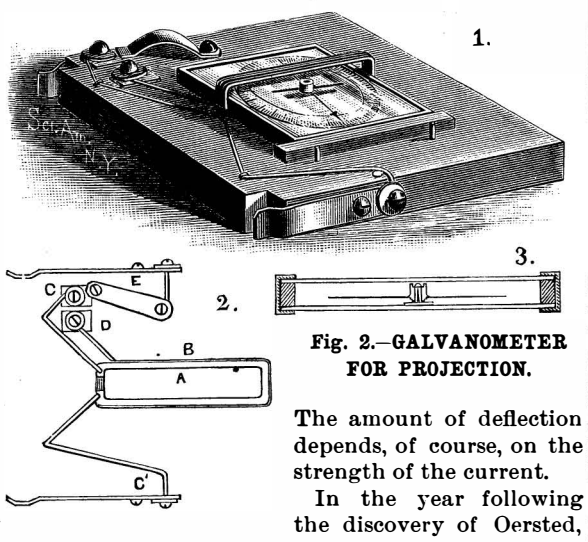



Fig. 2.—GALVANOMETER FOR PROJECTION.

The amount of deflection depends, of course, on the strength of the current.

In the year following the discovery of Oersted, Schweigger found that the power of the current over the needle was increased by causing the current to pass several times around the needle. Owing to this fact, the galvanometer was formerly known as the galvano-multiplier. A convenient and useful galvanometer for ordinary use, and for projection, is shown in Fig. 2; 1 showing the complete instrument in perspective, 2 being a diagram of the circuits, and 3 being a transverse section of the compass box. The foundation of this galvanometer is a fine photograph on glass of a complete scale of degrees of the size of an ordinary lantern slide. Upon the center of the photograph is cemented a small metallic disk, in which is secured a fine needle point, and upon the needle point is poised a jeweled compass needle taken from a pocket compass.

To diametrically opposite sides of the boss of the

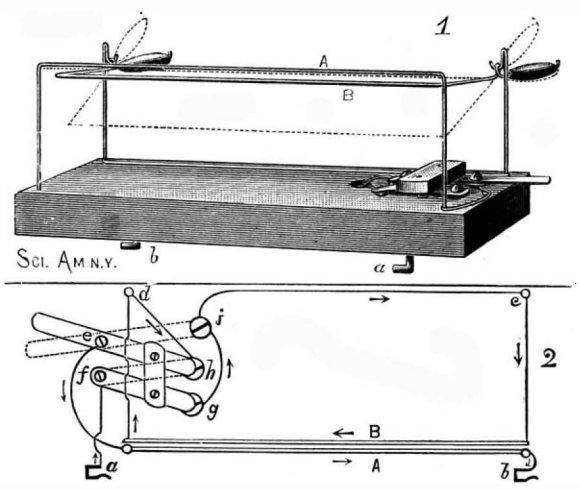



Fig. 3.—ATTRACTION AND REPULSION OF PARALLEL CONDUCTORS—AMPERE'S EXPERIMENT.

compass needle are soldered the heads of two entomological pins, which are perfectly adapted to this use, being long, thin, and finely pointed. These are arranged exactly at right angles with the needle. To one of these pins is cemented a thin paper arrow head, and upon the other pin is placed a small drop of solder to counterbalance the paper.

The compass thus formed is provided with a glass cover, separated from the scale by narrow strips of wood. The baseboard upon which the compass is mounted is provided with a round central aperture, a little larger than the circle of the scale. Across this aperture is secured an oblong rectangular coil, which will presently be described. The ends of the coil are let into recesses in the baseboard, so that when the compass is in its place the needle will occupy a central position in the coil. The compass, after adjustment, is fastened in place by six small brass screws, and along one edge of the compass is arranged a permanent bar magnet, which is held in its place by two pins. The bar magnet permits of bringing the pointers to zero, and renders the compass independent of the earth's magnetism, so that the galvanometer may be used in any position without regard to the magnetic meridian.

The coil consists of a narrow copper trough, A (see diagram), of U-shaped cross section, one-fourth inch wide and one-eighth inch deep, separated a short distance at one end of the coil, so that the current may be sent around the needle through the copper trough alone when desirable.

In the trough is wound a quantity of No. 40 silk-covered copper wire, forming the coil, B, one terminal of which is fastened to one end of the copper trough in such a way that the trough forms a continuation of the coil. The opposite or outer end of the fine wire coil is connected with the switch point, D. The corresponding end of the trough is connected with the switch point, C, and the remaining terminal of the trough is connected by a wire, C', with the contact spring at one edge of the baseboard. The contact spring at the opposite edge of the baseboard is connected with the pivot of the switch arm, E.

The contact springs are designed to make connections with the studs on the lantern, which in turn are connected with the conductors of the galvanometer circuit.

When the switch arm, E, is on the point, C, as shown in the diagram, the current passes through the trough only. Arranged in this way, the galvanometer is adapted to the measurement of heavy currents. When the switch arm is on the point, D, the current goes through both the fine wire coil and the trough. In this way the instrument is adapted to light currents. This galvanometer is adapted to the general run of experimental work. It makes a good image on the screen or ceiling when used in a lantern with a vertical attachment. The magnet interferes somewhat with its sensitiveness, and may be removed when very delicate action is desired.

In 1820 Ampere discovered that the action of a conductor in which a continuous current of electricity is maintained is like that of a magnetic needle. He replaced the needle by a delicately pivoted conductor, and demonstrated that all of the phenomena of the needle could be reproduced by the suspended conductor.

Another curious discovery, due to the same great physicist, is that of the mutual attraction and repulsion of parallel conductors. Apparatus for exhibiting this phenomenon is illustrated by Fig. 3. In this figure the perspective view shows the device adapted for projection, and the diagram shows the circuits.

Two parallel wires, A, B, are arranged one above the other, the wire, A, being fixed, the wire, B, being movable. The wire, A, is bent twice at right angles and its ends are inserted in the baseboard. The wire, B, is bent twice at right angles, and the arms thus formed are provided with eyes which are suspended on delicate pivots on the standards, *c, d*. These arms are prolonged beyond their pivots and provided with weights for counterbalancing the wire, the weights being so arranged as to cause the wire, B, to rest normally a short distance, say one-fourth or three-eighths inch, from the wire, A.

The connections with the battery or other electric generator are through the hooks, *a, b*. A current-reversing switch is provided, by which the current may be made to flow in the same direction or in opposite direction through the conductors, A, B. With the switch in the position shown, the current arriving at the hook, *a*, passes in the direction of the arrow to the switch arm, *f*, point, *g*, point, *i*, and standard, *c*, through the conductor, B, to the standard, *d*, thence to point, *h*, to the switch arm, *e*, thence through the conductor, A, to the hook, *b*. The current flowing in opposite directions through the conductors, A, B, causes the repulsion of the conductor, B.

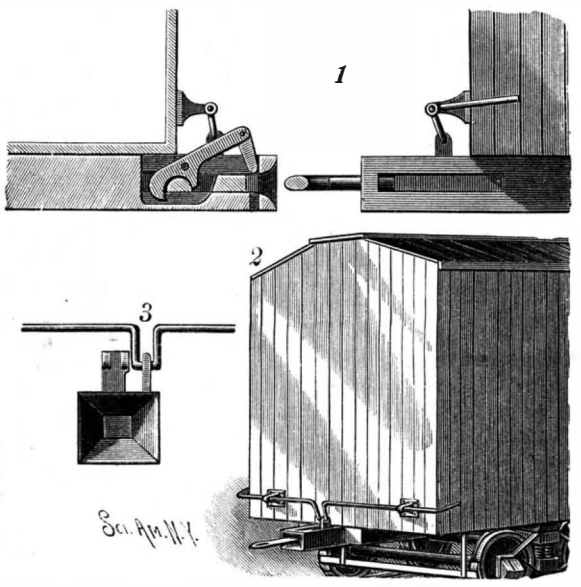
By shifting the switch arms, *e, f*, to the points, *i, h*, the current will flow through both conductors in the same direction, thereby causing them to mutually attract each other, the result being the movement of the conductor, B, toward conductor, A. This apparatus is designed especially for projection, the parallel wires only being visible on the screen.

### Total Eclipse on New Year's Day.

A total eclipse of the sun will take place on January 1, 1889. The line of totality goes through a portion of California, Nevada, and Idaho. The Lick Observatory is directly in the path of the central line.

## AN IMPROVED CAR COUPLING.

A car coupling designed to automatically couple cars as they come together is illustrated herewith, and has been patented by Messrs. George W. Dawson and Benjamin F. Cleveland, of Sac City, Iowa. The drawheads are duplicates of each other, and in each is a sliding block that is forced back by the entrance of the connecting link. This block is vertically recessed to form a rounded portion, which serves to raise and lower the outer end of a pivoted bar on which the coupling pin is pivoted, as shown to the left in Fig. 1, this pivoted bar working in a slot in the upper surface of the drawhead, and its lower edge being recessed to form projections which span the rounded portion of the sliding bar. To lift the coupling pin for uncoupling, the sliding block must be forced forward in the drawhead, which is effected by a rod held across the end of the car, and bent

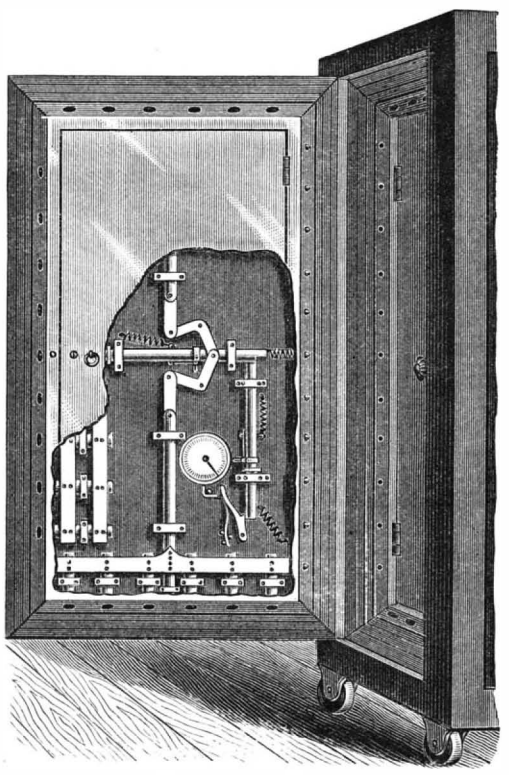



CLEVELAND & DAWSON'S CAR COUPLING.

to form a crank which connects with an arm attached to the sliding block, as shown in Figs. 2 and 3. When the sliding block is forced forward, it not only serves to lift the pivoted bar and coupling pin, but holds them in elevated position, ready to receive and engage the link of another car.

## AN IMPROVED SAFE OR VAULT DOOR LOCK.

The accompanying illustration represents a safe or vault door which locks automatically when it is closed, and unlocks automatically at any predetermined time at which the clock which actuates the works may be set prior to closing the door. This has been patented by Mr. William M. Brown, Jr., of No. 1627 H Street, Sacramento, Cal. Our engraving shows an inside face view of the door partly broken away, with the bolt works in the position they have when the door is open and just prior to closing it. The door is made principally of steel and iron plates bolted together and rabbeted at the edges to fit into corresponding rabbets at the front of the body of the safe, and the lock or set works are so arranged as to give no clew to their arrangement on the safe door, being covered by an inner



BROWN'S SAFE OR VAULT DOOR LOCK.

door, which is opened to set the hands of the clock mechanism at the time the door is to open. The clock mechanism has a dial, preferably divided into hours from 1 to 24, and its hand is set to cause the spring barrel at any predetermined time to draw on a downwardly extending cord and lever, pulling a shoulder of

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the lever from under a vertical bar, allowing a spring to draw this bar downward clear of a shoulder of the horizontal main bolt bar. A spring is connected to this bar and the door to draw the bar inward and simultaneously withdraw the bolts from the top and bottom and outer edge in the jamb of the safe, to unlock the door. The trip lever is automatically set as the bolts are thrown when the door is closed, to prevent the opening of the door until the desired time, when it opens of itself, without the use of any outside knob or device to disclose the position or arrangement of the bolt works.

### How to Have Healthy Swine.

Keep large and small separate and not more than ten in a lot.

Feed regularly and liberally of wholesome food, always some bulky food, and let each feed be eaten up clean before more is given.

Give wallowing places, ashes, charcoal, and salt, and plenty of exercise in timber pastures yielding shade, roots, nuts, acorns, etc. But no doubly soured slops.

Provide ventilated shelters from wind, rain, and snow, but no litter. Hogs with litter get too warm. If you wish disease, put your hogs to the straw pile.

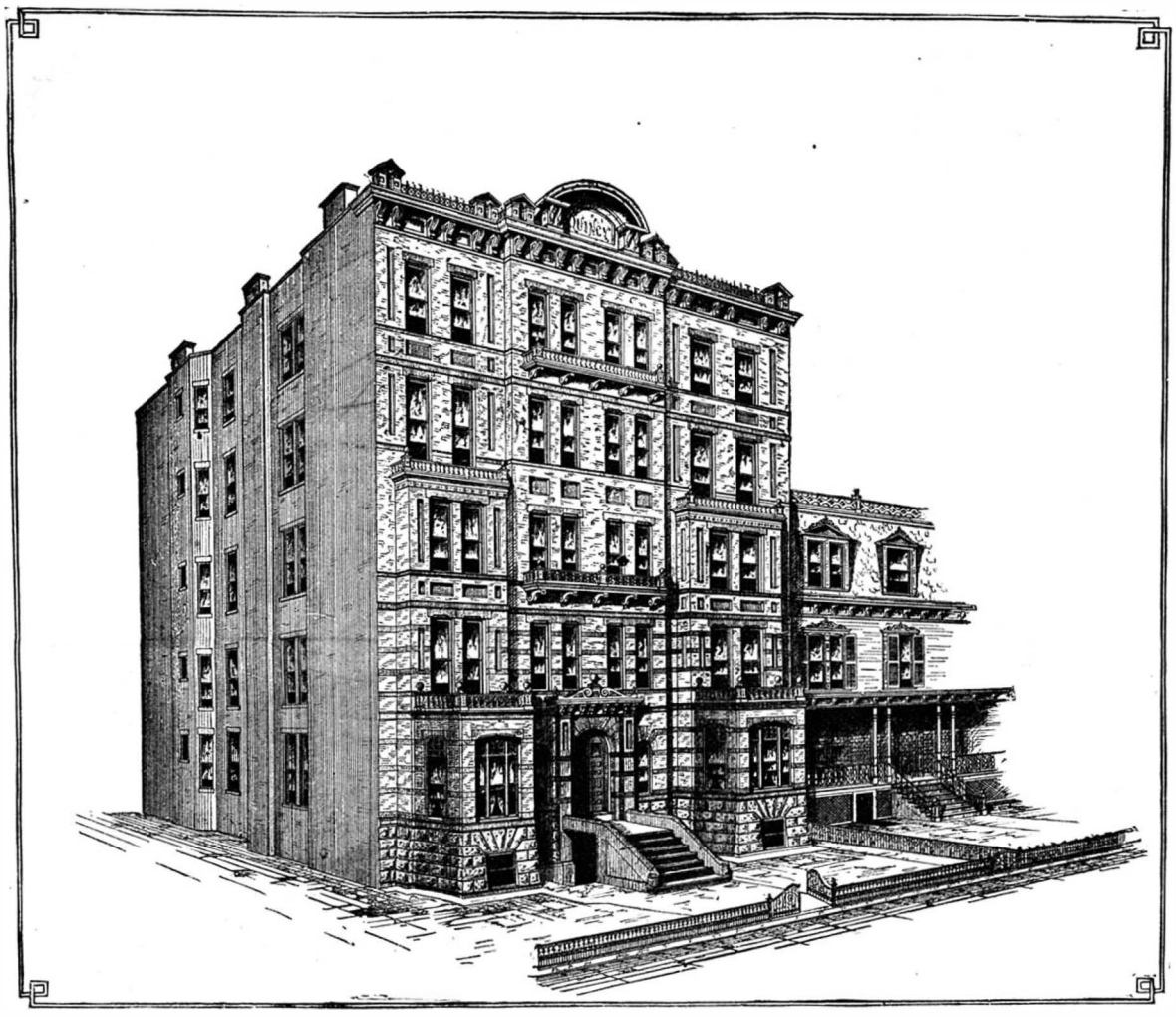
Maintain cleanliness in all things. Breed only mature animals, and never from a show herd. The offspring of immature or pampered animals is predisposed to disease.

Give pure water, from deep wells protected from surface water. Well water is not freezing cold in winter nor lukewarm in summer. Water from creeks (unless fed by springs), ponds, or pools is disease-breeding.

Pigs should be farrowed in early spring and kept only on growing foods—milk, bran slops, oats, green rye, grasses, clover, sweet corn—until late fall; then fatten rapidly, on corn mostly, but also green rye, blue grass, pumpkins, boiled potatoes and turnips, with bran, steamed clover hay, etc.—*American Agriculturist.*

### HOMES FOR THE MANY.

The two houses represented in the accompanying illustrations are as different in character as could well be selected. The building in the upper cut is a good type of the better class of Brooklyn apartment houses. It is situated on Quincy Street, between Nostrand and Marcy Avenues, and was erected at a cost of about $50,000. It has a frontage of 55 feet, and is 95 feet in depth. It was erected from the plans of Amzi Hill, architect.



NEW APARTMENT HOUSE, BROOKLYN, N. Y.

The country residence shown in the other cut was erected for Mr. Edwin A. Burgess, at Buttonwood, R. I., and is a good representative of an inexpensive seaside or summer residence. With a well planned interior, an extension kitchen, and spacious piazzas, it affords an airy, cool, and comfortable home.* It was built about two years ago, at a cost of about $3,000.

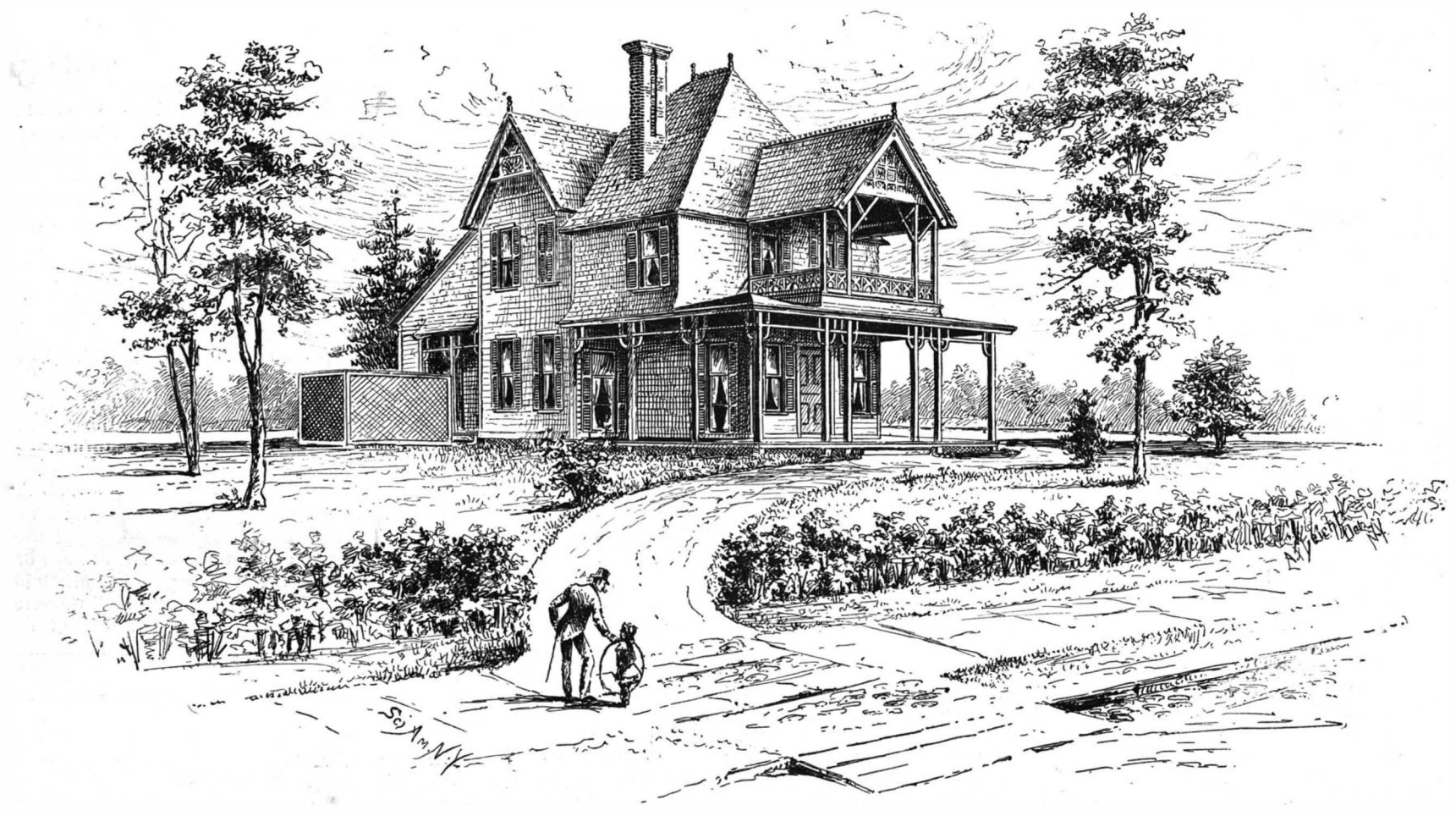
### Storage Battery Motors.

To try and try again, even though the promise is small, to overcome one obstacle and then another, certainly deserves even if it cannot command success; and so it is that, if the storage battery motor people, now experimenting upon one of our surface railway lines, do not eventually show their system practically suited for such employment, it will not be for lack of industry, of brains, and of ingenuity. Two months ago only one car was making regular trips, its batteries needing recharging from the central station after each round trip of twelve miles—a process requiring some four or five hours. Now there are three cars running, the same needing recharging only at the end of the second round trip on the twenty-four miles, with only three hours consumed, at least so it is said, in the operation. Further than this, it is claimed that, in the not distant future, the apparatus bids fair to be that much perfected that only one charging will be required for the day's work of three round trips and thirty-six miles. As to the relative cost of this type of traction, we cannot speak with certainty; but as to its convenience, no one who has seen these cars will have a doubt.

### Oil of Sassafras.

The manufacture of the oil of sassafras is becoming an important industry in some parts of the country, especially in the Southern States, where this tree is common. Only the roots are used; they are chopped up into small pieces by a machine constructed for the purpose, the oil being then distilled from the chips by the aid of steam. About one gallon of the oil, weighing nine pounds, is obtained from 1,000 pounds of the chips. The uses for which the oil of sassafras can be employed are numerous and varied. It is a favorite perfume for soaps and candies; it is used as a solvent for different gums, and as a liniment. It is also very largely employed in the manufacture of several popular proprietary medicines. The importance of this industry may be expected to increase rather than diminish, as the sassafras and the persimmon are the two trees which are spreading most rapidly over the old and abandoned fields throughout the Southern States outside of the pine belt proper; and at present prices good wages can be made digging out the roots.—*Garden and Forest.*

*See ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN of May, 1887, which contains the floor plans, and which gives a description of the construction and the materials used in both these buildings. Single copies, 25 cents, or $2.50 a year.



AN ATTRACTIVE CHEAP DWELLING HOUSE.

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## DECISIONS OF THE UNITED STATES COURTS.

### Supreme Court of the United States.

A TRADE MARK CASE.

THE LIGGETT & MYERS TOBACCO COMPANY *vs.* FINZER.

*Decided November* 5, 1888.

Appeal from the Circuit Court of the United States for the District of Kentucky.

The Liggett & Myers Tobacco Company, a corporation created under the laws of Missouri, manufactures plug tobacco at St. Louis, in that State. This tobacco is put up for sale, marked with a star made of tin, having five points, and a round hole in the center, and attached to the plug by prongs at its back. The bill alleges that the complainant has for many years been extensively engaged in manufacturing this plug tobacco and in selling the same in large quantities in St. Louis, Louisville, and throughout the United States, and that every plug has been marked with such a star; that from the care taken in its manufacture the tobacco has acquired a great reputation, and large quantities are constantly required to supply the regular demand; that by reason of the distinguishing mark of the star upon the plugs it has become known to the trade and the public as "star plug tobacco;" that the complainant was the original manufacturer of this tobacco with the design of a star affixed to the plugs, and that the defendant, knowing all this, is manufacturing and selling at Louisville, Kentucky, plug tobacco to which is affixed a round piece of gilded paper having on it a red star, under which the word "Light" is printed, and that this mark is calculated to mislead the trade and public and induce them to purchase tobacco from the defendant as star tobacco of the complainant, to his manifest injury, all of which is contrary to equity and good conscience. He therefore prays that the defendant may be enjoined from using that star on any plug tobacco manufactured by him.

The defendant admits these several allegations, except the one asserting that the complainant was the original manufacturer of plug tobacco with a star attached to the plug and the one asserting that the star used by him is calculated to mislead the trade and public to purchase the tobacco manufactured by him for the tobacco manufactured by the complainant. Upon the first of these two points the testimony establishes the fact that the complainant was the first person to use a star made of tin and fastened upon plug tobacco as described above, but that he was not the first person to use the design of a star upon plug tobacco. The priority of use, therefore, by the complainant extended only to the tin star, and not to the design of a star generally. Upon the second of the two points there is even less ground to sustain the position of the complainant. The two stars, the one used by the complainant and the one used by the defendant, are so different in form and surroundings that it would not be possible for any person not afflicted with color blindness to mistake the one for the other. They differ in size and color. The star used by the complainant on its manufactured goods is only a little over half an inch in diameter, with a hole in the center. The mark used by the defendant consists of a round paper label over three-fourths of an inch in diameter, with a red star and the word "Trade" on one side and the work "Mark" on the other, in gilded letters on a red background, and having beneath the star the word "Light," thus forming by the figure and the letters the word "Starlight." One star has the silvery appearance of tin foil, the other has the glare of a red and yellow gilded background. The judgment of the eye upon the two is more satisfactory than evidence from any other source as to the possibility of parties being misled so as to take one tobacco for the other, and this judgment is against any such possibility.

Seeing in such case is believing, existing differences being at once perceived and remaining on the mind of the observer. There is no evidence that any one was ever misled by the alleged resemblance between the two designs. But, in addition to the want of resemblance in the stars, the plugs to which they are respectively attached are of different size and weight. And it appears, also, that the name which the defendant has given to his plug tobacco is "Starlight," instead of "Star," tobacco, and is thus distinguished in name not only from other tobacco manufactured by him, which he calls "Sunlight" and "Moonlight" tobacco, but also from all plug tobacco manufactured by the complainant.

Decree affirmed.

Mr. Justice Field delivered the opinion of the court.

### Supreme Court of the United States.

THE CRESCENT BREWING COMPANY *vs.* GOTTFRIED.

*Decided November* 5, 1888.

Appeal from the Circuit Court of the United States for the District of Indiana.

The first claim of Letters Patent No. 42,530, granted May 3, 1864, to J. F. T. Holbeck and Matthew Gottfried, for an improved mode of pitching barrels, is, so far as it is a claim to a process, fully anticipated in the process carried on by means of the Seibel apparatus, and so far as it is a claim to an apparatus used for applying a heated blast to the interior of a cask, the apparatus existed before.

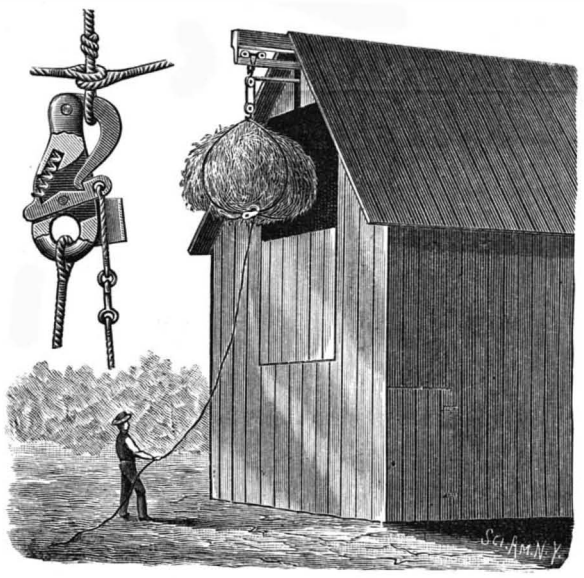
The second claim is not infringed by the defendant's apparatus, it having no removable conductor corresponding to the conductor, E, of said claim.

Decree of the Circuit Court reversed and the case remanded to that court, with directions to dismiss the bill of complaint, with costs.

Mr. Justice Blatchford delivered the opinion of the court.

## AN IMPROVED BOTTOM-TRIP SLING.

A tripping device adapted more particularly for attachment to the several binding strands of a rope or chain used for hoisting hay, etc., and whereby the load may be readily released after it is deposited in the desired place, is illustrated herewith, and has been patented by Messrs. Joseph W. Wood, of Baraboo, Wis., and Alvinus B. Wood, of Tacoma, Washington Ter. The body of the clamp is preferably of metal, cast in one piece, a hook being pivoted between ears in its upper end, an outwardly extending lip on the lower end of the hook being adapted to engage a recess in the outer end of a lever pivoted near the lower end of



WOOD'S BOTTOM-TRIP STRAW SLING.

the device, this lever being held in engagement with the lip of the hook by means of a spring secured at its opposite end. The illustration shows the use of the device where four binding ropes are employed, to be united in any approved manner about the bundle of hay or other material, the four ropes to be united in the center by the clamp, while a trip rope is connected with the outer end of the pivoted, spring-held lever, engaging the lip of the hook. When the load is carried to the desired place, a quick jerk on the trip rope releases the hook, permitting the ready detachment of three of the ropes therefrom, while the weight of the load releases the eyes of the other strands, thus depositing the load.

For further information relative to this invention address Mr. J. W. Wood, Baraboo, Wis.

## Mr. Keely's Motor.

The Philadelphia court which thought it could keep Mr. Keely in confinement has seen its error. As the *Tribune* has already remarked, Mr. Keely is out of jail and has returned to his motor. Some of the earlier of the stockholders are not yet out of the poorhouse—but this is neither here nor there.

The short and simple annals of Mr. Keely's motor are soon told. Some twenty years ago, more or less, Mr. Keely built his motor. There are a number of pipes, wheels, pulleys, rods, belts, levers, cocks, cams, and cogs visible, besides, it is darkly hinted, a vastly greater number of the same sort of thing under the floor and back of the partition. In front of the motor is Mr. Keely's office, in which there is a large slot. The stockholders drop their money in the slot, and Mr. Keely looks out and watches them walk away. Naturally Mr. Keely is sometimes called upon to explain the workings of his motor by some doubting stockholder. On such occasions he is all smiles, and, conducting the victim into the presence of the machine, he says: "You see, my friend, the way we operate the motor is this: Taking hold of this lever we pull it toward us. This causes the small flip-flap you see there to be withdrawn, allowing the flibber snatcher to fall into its place on the ramrod. As soon as this happens, it acts directly on the hatchway and the slam-bang, causing them to make a half-revolution and start the get-up-and-get motion of the flunker-flopper, which in turn communicates its energy to the button hook and the wapperchock. After these things have run for about five minutes they cause the jig-jag valve to turn, and the asthmatic gas flows through the pipe to the cylinder and gives the wiggle motion to the gilder fluke. That's the point we are striving after—the wiggle motion of the gilder fluke. Why, my dear sir, without the wiggle motion of the gilder fluke you wouldn't think of putting your money into the motor. But, with it, sir, we are—eh, another share? All right, come into the office and I'll have it made out for you inside of a minute."

Professor Keely has been much more successful in the mechanical manipulation of the stockholders' money than in the management of his motor. Taking hold of the middle of a bill, of any denomination, with the thumb and forefinger of each hand, he bolds the end of the bill toward his person. By a dexterous movement of the fingers he causes the bill to fold across the center. Repeating the process, he has it reduced to the proper compass for wadding into his pocket book, which is the next movement. This most ingenious gentleman, Don Keely, then places the purse in his right hand trousers pocket and smiles quietly. The mechanical action is perfect, and leaves nothing to be desired.

Mr. Keely's mental endowments seem to run in particular lines. He appears to have no mechanical ingenuity, his strong point being his ability as a collector. He has one of the largest and best arranged collections of other people's money to be found in the United States. Having, a number of years ago, during a fit of temporary insanity, constructed a machine which, if any power on earth could start it, would explode and pierce the startled dome of heaven with flying fragments of cog wheels and cranks, he now sits down calmly and allows this same mechanical nightmare to make his living for him. This is genius. The man who can create a company, stock in which is placed among the holder's liabilities when he fails, and then continues to sell this stock every day, is doing something that ordinary men of talent cannot do. He has risen above them. This is Keely. He toils not, neither does he spin; but he has got a hysterical collection of crooked pipes and lop-sided wheels tied up in his back room that extract the reluctant dollar from the pocket of avarice without fail.

## The Forests of Alaska.

The prevailing forest tree of Alaska, says Mr. George Davidson, of the Coast Survey, is the Sitka spruce, growing to great size, covering every part of the ground, and climbing the steepest mountain sides to the height of 2,000 or 2,500 feet above the sea.

This tree resembles in form and foilage the silver firs of California. In the Archipelago Alexander, *with a shore line of more than* 7,800 *statute miles*, the land is densely wooded from the water's edge. It can never be devastated by forest fires, because the carpet of wet *sphagnum* over the surface of the country effectually prevents fires from spreading.

We measured felled spruce trees that were 180 feet long and 4 feet thick at the butt; while adjacent standing trees measured over 6 feet in diameter, were branchless for over 50 feet, and estimated to be 250 feet high.

Hemlock, alders, and willows are found; but the most remarkable wood of the country is the yellow cedar, with fine, even texture, fragrant smell, good size, and greater strength than the spruce. It is readily worked, takes a smooth surface, and is remarkably durable. It is a valuable addition to the cabinet woods, and is *superior as a ship timber to any on the coast.*

It can be obtained of ample size for frames and knees of ordinary sized vessels. We measured one 18 feet in circumference, and estimated it to be over 125 feet in height. We collected part of the keelson and frame of a Russian vessel built of this wood thirty-two years before, and which had been lying a wreck on the beach for several years. It exhibited no signs of decay nor of *teredo* attacks, and the wood around the copper and iron bolts is nearly as well preserved as on the day they were driven.

On Kadiak Island the forests cease toward the south. The yellow cedar does not grow on the northeast part of the island; but the average size of the spruce is less than two feet in diameter.

Hemlock is found in abundance, and has its value for tanning purposes.

When the forests of Washington Territory and Oregon are exhausted, Alaska will be the great and our almost inexhaustible resource in the future.

## The Source of the Mississippi.

J. V. Brower, who has just returned to St. Paul from Itasca Lake, the source of the Mississippi River, will soon make public a map and detailed report of his examination of the Itasca basin. It includes a measurement of the inflow and outflow of all the streams at that point. The true source of the river is disputed, and Dr. Brower's researches locate it in the interior of section 21 of the government survey, in a small lake laid down on the maps and charts of Jean N. Nicollet in 1836, four years after the visit of Schoolcraft, who fixed the outlet of Itasca as the proper point of commencement. The claims made by Willard Glazier in 1881 are found to be false. Mr. Brower was formerly register of the St. Cloud Land Office, and is fully posted in regard to the history and exploration of the locality.

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### The Integrating Machine.

At a recent meeting of the American Institute of Electrical Engineers, in this city, Mr. B. Abdank said:

There is one of these machines constructed in Zurich by the celebrated constructor, Coradi. To perform the integration it is sufficient to follow with the tracing point the given curve. The integral curve is then mechanically traced by the instrument. The integration of differential equations is a problem that we meet continuously in the physical sciences. We perform an integration in determining the area of a given figure, also in determining the static moments and the moments of inertia, in calculating the shape of the elastic curve.

The planimeter, as you know, gives mechanically the area and the moments. The instrument that you see before you gives much more. It traces a curve that indicates how the integral increases. The curve is the integral curve, the applications of which are extremely numerous. You have seen one of these applications for the determination of the magnetic curve.

I am glad to have had the opportunity to present it to this electrical society, and, as it were, smuggle into your presence a mathematical instrument under the cover of an electrical application. And I do so because the apparatus interests me personally, being myself the inventor of it.

I must also crave your pardon for having addressed you in English, of which language I am not at all a complete master, and I am ashamed because that lack of knowledge is entirely contrary to my principles. I am of the opinion that every electrician ought to be able to speak English. He cannot be a good electrician without being a complete master of that language. Without an intimate acquaintance with the works of Faraday, he is not able to draw conclusions in a simple and logical manner from experiments. He cannot, without being in direct communication with the legion of workers in electricity who speak the English language and who have advanced electricity in this country to a point where it is fifty years ahead of that in Europe, I say, that without knowing it intimately, he cannot keep track of what can be done with that power of nature which we are all attempting to harness.

Mr. Wolcott.—Having been for some time interested in the study of integrating machines of various kinds, and having invented some myself, I can say that I never have seen anything which will approach this instrument. The ordinary type of integrating machine which Mr. Abdank has spoken of will simply give a reading at the end of a given time—simply a single reading of the integral available. All who have given any study to the subject are familiar with the apparatus of Prof. James Thomson, Sir William Thomson's brother, which will integrate any expression involving a single variable. It is simply a disk and a sphere in a cylinder. The distance of the point of contact of the sphere from the center of the disk will represent the variable quantity, that is the function, and if this distance can be made to follow any required law of motion, and that point of contact of the disk is transmitted to the circumference of the cylinder, which is uniform the whole length, it is evident that the motion of the cylinder is proportional to the distance of the sphere from the center of the disk. This apparatus, in combination with others, will also integrate differential equations. I do not think there is any apparatus like this which will trace one curve, the ordinates in which are integrals of the ordinates in the other curve.

Carl Hering.—I would like to say in behalf of Mr. Abdank that one of the features of that instrument besides tracing the integral curve is that it can be used for solving numerical equations which, I understand, cannot be solved algebraically—equations of a high degree, fourth, fifth, and sixth degree. The instrument will trace out a curve the dimension of which will give the values of equations of high degree, and give all the real roots in one curve.

Prof. Mayer.—If the machine will do that, it is a marvelous production of ingenuity and science. Charles Babbage, of England, gave his whole life to making a calculating engine. After he had perfected his differential engine, and the British government would not supply him with means of bringing it out, he invented an analytical engine, of which you will find a description by the only daughter of Lord Byron, Lady Lovelace, which did just what this does. The construction of it would be so difficult that Babbage had not the means of bringing it out. If a machine so simple in its construction will do that, I can see that it is the most marvelous production of this age. I would like very much to understand it. Of course I only see it there and I know nothing of its principle.

The Chairman, Capt. Michaelis.—I understand, Mr. Abdank, to put it in plain language, in solving any equation of the second degree the instrument would describe a conic section, and higher curves according to the nature of the equation.

FOR BRASSING SMALL ARTICLES.—To 1 quart water add half an ounce each of sulphate copper and protochloride of tin. Stir the articles in the solution until the desired color is obtained.

## Correspondence.

### White and Sugar Maple.

*To the Editor of the Scientific American:*

Your answer to query No. 21, page 331, to correspondent, that "white and sugar maple are the same," is not correct. White maple is *Acer dasycarpum*. Sugar maple is *Acer saccharinum*. Their resemblances and their differences are stated in all the botanies.

W. C. PECKHAM.

New York, N. Y.

### The Highest Peak in the World.

*To the Editor of the Scientific American:*

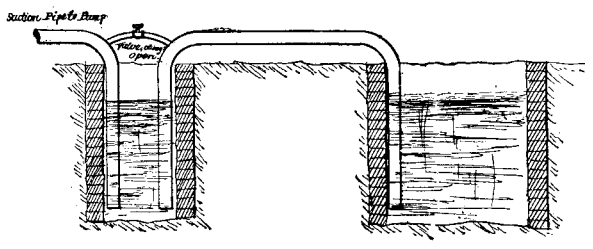
In issue of SCIENTIFIC AMERICAN November 24, 1888, in answer to query No. 21, by O. S., you give Mount Everest, of the Himalaya Range, as the highest mountain in the world. According to Gaskell's New Family Atlas, Mount Hercules, in New Guinea, now claims that honor. Its height is given as 32,768 feet. The same authority gives Mount Everest 29,002 feet, so that Mount Hercules leads the world as the highest mountain by 3,766 feet. THOS. D. GILLESPIE.

Pittsburg, Pa., December 6, 1888.

### SELF-CHARGING SIPHON.

In your issue of November 17, page 307, you describe a siphon used by East Orange Water Works. I do not fully understand it, and should be greatly obliged for a diagram of such a siphon. F. S. OAKES.

Cattaraugus, N. Y.




[We give the diagram above as requested. It is self-explanatory.]

### Periflora Graeca.

*To the Editor of the Scientific American:*

I wish to call attention to this curious vine, that has not been much noticed. It is rarely found in the nurseries and seldom seen as a climber in ornamental grounds.

Its flowers are not showy, but curious—greenish yellow below and brownish purple above and singularly formed. Leaves few and opposite, about the size and shape of a peach leaf, but not recurved like the peach leaf. It has a slight inclination to twine, but generally grows straight and of great length, and is about as thick at its extreme point as at the root. The vine is generally about from one-fourth to one-half inch thick from end to end. One of its most striking features is its toughness. It may be tied and untied and used as a rope without breaking. It would not be difficult to grow it 30 or 40 feet long in one season, several vines from the same root, of even size, straight and smooth. We should suppose in basket making or such work it would be quite an acquisition. As to its propagation from cuttings, we have no experience, but it grows readily from roots. J. H. CREIGHTON.

Lithopolis, Ohio.

### A New "Strong" Locomotive.

A recent number of the Providence *Journal* describes as follows the new monster locomotive built by the Hinkley Locomotive Company, Boston. She is designed and constructed for the Strong Locomotive Company, New York, for the Atchison, Topeka, and Santa Fe Railroad. It is the latest built of the "Strong" locomotives. The improvements are the invention of Mr. George S. Strong, at one time mechanical superintendent of the Lehigh Valley road.

The peculiarity in the construction of the Strong locomotive is in her furnaces and combustion chamber, her cylinder valves and valve gears, and in the arrangement of her wheels and running gear. The boiler has two furnaces, each one being a welded and corrugated steel cylinder 42 inches in diameter and 7 feet long. These two furnaces are joined by a flanged and corrugated junction piece, a corrugated cylindrical combustion chamber, making the grate area of 50 square feet, with a combustion chamber 9 feet from the face of the bridge wall to the tube sheet, and 16 feet from the fire door to the tube sheet. The total heating surface is 1,650 feet. By this construction all braces and stay bolts and crown bars are done away with, the gases being all consumed and all the smoke prevented. The sparks are not drawn from the fire box, and no spark arrester is required, the engine running without smoke or sparks. The original Strong engine would even burn culm, the refuse of the pit mouth, and this engine will use anthracite or bituminous coal with good results.

The other radical departures in the build of this locomotive are in the cylinders, valves, and valve gear, there being no steam chests on top of the cylinders, as in ordinary engines. There are four valves interposed in the passages back of the cylinders—one for steam and one for exhaust at each end, every valve being a gridiron plain slide. There are nine ports 4¼ inches long on each valve, making 38¼ inches the length of port on each valve. This large valve area admits the steam at very nearly boiler pressure on the piston, and the steam valve cuts it off at the will of the engineer at any place from 4 to 22 inches, the exhaust valve holding on to the steam until the last inch of the piston travels, when it opens wide, letting the steam go freely with very little back pressure. This peculiarity enables the engine, at high speed, to develop about double the horse power that an ordinary locomotive, with equal sized cylinders, 19 × 24 inches, at an equal cut-off, would be able to do, an engine similar to this one having shown the enormous strength of 1,810 horse power while pulling a train of twelve Pullman coaches on the Northern Pacific road at a speed exceeding sixty miles an hour. The same engine has pulled a train of ten cars 148 miles in 148 minutes running time. This was done on a five-foot wheel six-coupled engine.

Returning to a description of the valve gear, the valves are operated by a single eccentric for each cylinder, the eccentric being keyed fast to the shaft or axle.

This eccentric runs the engine both ways, and imparts an independent motion to the steam and exhaust valves, so that the engineer has perfect control over the point of cut-off without altering the travel of the exhaust, and can alter the compression without changing the travel of the steam. In this manner the engine makes the same card or gives the same distribution of steam as a nicely adjusted Corliss or Greene engine would do at a given high piston speed. This enables her to do her work with from 20 to 33 per cent less water, and consequently less steam. Her large grate area enables her to burn her coal so as to give an evaporation from 25 to 33 per cent higher than ordinary locomotive boilers doing the same work, so that the combined action of boiler and valve gear is to make a very economical engine, and one that is capable, it is claimed, of taking an extremely heavy train of from ten to fifteen cars and making 60 miles an hour with ease.

The locomotive has four wheels, swing truck, under her front end, like an ordinary machine. Her drivers, 68 inches in diameter, are midway between the front and rear ends of the boiler. Back of the drivers is a two-wheel pony truck, 42 inch wheel, which is equalized with the drivers, making ten wheels under the engine. The tender is carried on a four-wheel truck forward and a six-wheel truck back, making ten wheels in all under the tender. The total weight is over sixty tons. The engineer's cab is over the hind driver, forward of the double fire box. He has a very extended view of the track on both sides, and is entirely away from the dirt and dust of the tender, and his cab rides as nicely and as cleanly as a parlor car. The fireman has a cab on the back end of the fire box entirely to himself. They have communication by a passage over the top of the fire box between the two cabs, the engineer having a call bell with which to summon the stoker if he wishes to speak with him. The locomotive wheel base is 28 feet; the wheel base of engine and tender, 48 feet; total length over all, about 55 feet. The highest point of the engineer's cab is 13 feet 7 inches from the ground. Her fireman's cab, which, like the driver's, is very roomy, is built of heavy iron plate. The engine has no extended front arch or netting or device for spark arrester, as they are not required.

### Pyrotechnic Photography.

A curious photographic apparatus, in which a camera is raised by a rocket and lowered by a parachute, is being developed by a French inventor, M. Amedee Denisse. In its experimental form, the cylindrical camera has twelve lenses round its circumference with a sensitive plate in its center, and is provided with a shutter which opens and instantly closes as the apparatus commences to fall. The descent is eased by the opening of the attached parachute, which is drawn back to the operator by a cord attached before the firing of the rocket. For securing bird's-eye views, the photo-rocket offers several important advantages over balloon photography, such as comparative cheapness in operating and freedom from risk in case of use for military reconnoitering.

### Walking on the Water.

C. W. Oldreive lately accomplished the task of walking on the water of the Hudson River from Albany to New York. Distance about 150 miles, wager $500. His average progress was twenty-four miles a day. He always went with the tide.

The shoes he wore are made of cedar, lined with brass. They are five feet long and a foot wide. Each is air tight, with a space in the center for the foot. On the bottom are three fins so arranged that when the shoe moves forward they are pressed up against the bottom, and when the shoe is at rest they hang downward, like paddle wheel buckets.

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### ELECTRICAL AIDS TO THE DRAMA.

The moon in nature borrows her light from the invisible sun, but the moon at the Metropolitan Opera House gets his from an electric lighting station in 25th Street, nearly a mile away; the energy coming along the overhead wires, up Broadway, piercing the stage door, thence through the wings and up in the mimic sky over the stage. So, when the Fair Marguerite, in the IV. act of the opera "Faust," thrusts her hand out of the window of the garden pavilion and exclaims,

"How sweet the notes of yon nightingale,
How soft this moonlight!"

she not only compliments the excellent imitation of that bird, as given by Herr Hans Hochschlagen, crouching in the wings, but pays a deserved tribute as well to the stoker, engine driver, and dynamo man in the distant lighting station.

The designer and operator of the moon —we refer, of course, to the terrestrial one—is Mr. James Stewart, a clever mechanical and electrical engineer. When he was asked last week as to its mechanism, he led the way behind the scenes, through mimic rocks and bowlders, pictured mountains, tropical forests, and Scandinavian wastes, with here a ferocious dragon blocking the way and there an uncanny-looking gnome peeping out from a cave. A flight of narrow stone steps led upward from the darkness, and a crooked passageway ended at a room where, upon a high shelf, the sun and the moon were resting snugly, besides some evening and morning stars and a few other planets.

"Hermann!" he called to a man preparing a ripple-effect for the river Rhine in "Rhinegold," "Hermann, just take the ladder and go up there and bring the moon down."

This moon (Figs. 4 and 5) is about 18 inches in diameter, of porcelain or milk glass, and oval in form. Within are six incandescence lamps of the ordinary type, three red, three white, each of 16 candle power, connected with the street circuit and also with a resistance coil. In "Tannhaeuser" the knight and minstrel of that name, tiring of the refuge he has found from the griefs of earth in the hill of Venus (the Hörselberg in Thuringia), regains his liberty, and, traveling through the country, finds himself in a valley between the Wartberg and the Hörselberg. Here he pauses to be charmed by the beauties of ~~that nature he has been~~ hiding from. The current in the electrical moon is switched into the three red-globed lamps, the white cut off. It rises between the hills, a great fiery red globe, as we often see the heavenly orb on a clear evening when at its full. The hills are in a glow, there is a shimmer among the tree tops, the red growing fainter and fainter as it mounts, from the lowering of the intensity of the current, till finally the red lamps are cut off, the white ones turned on; the hills and trees are silvered, the little lake becomes a mirror, the bordering trees projecting their shadows athwart it.

The moon is moved by means of a "batten," a thin piece of wood let down from above, the course being marked for the operator by the apparent though exaggerated movements of the moon as we see them in an orrery. The mimic sun moves behind the "drop" (the short curtain in the background), but the moon moves before it, and hence, to keep up the illusion, the wire or electrical main it drags after it must be colored as is this "drop." This is called "masking in." The edges are carefully pared off around the disk and the muslin serving perforated, else it would cast a shadow backward and show the sky to be only a curtain.

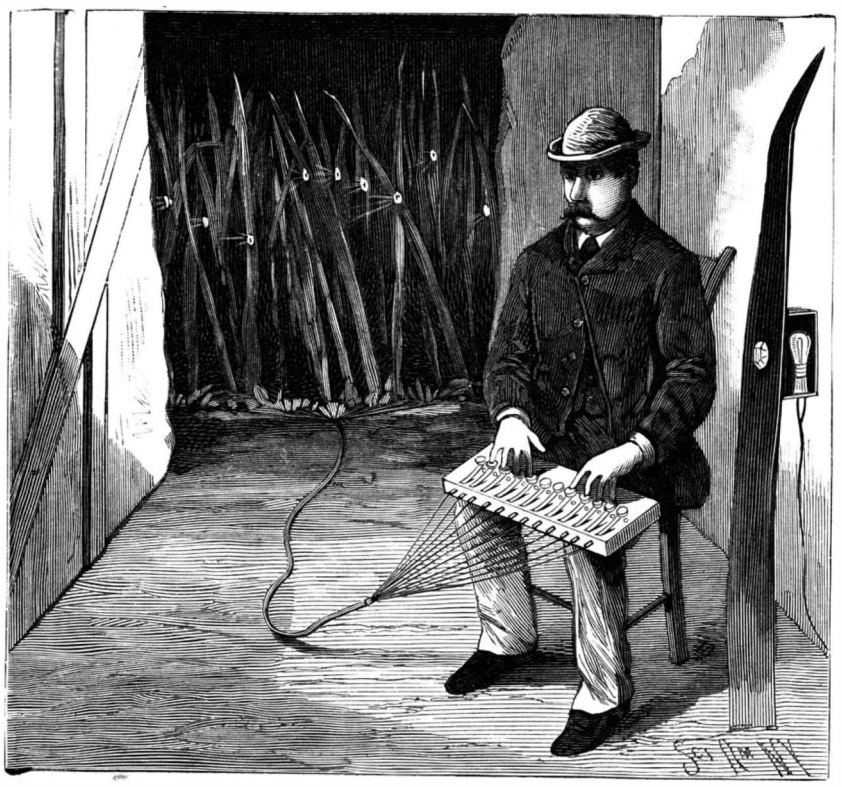


Fig. 10.—ELECTRIC FIREFLIES.

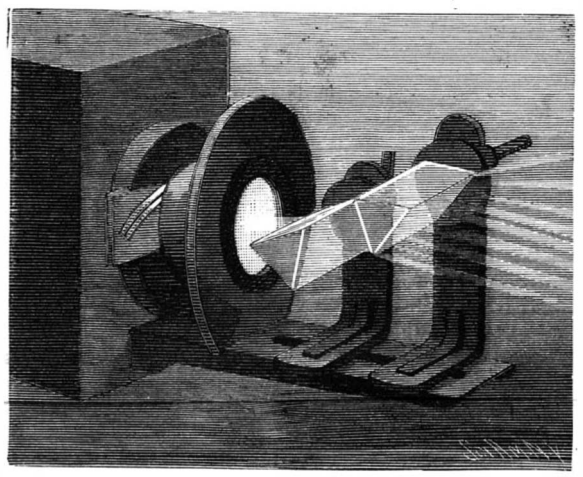


Fig. 9.—RAINBOW EFFECT.

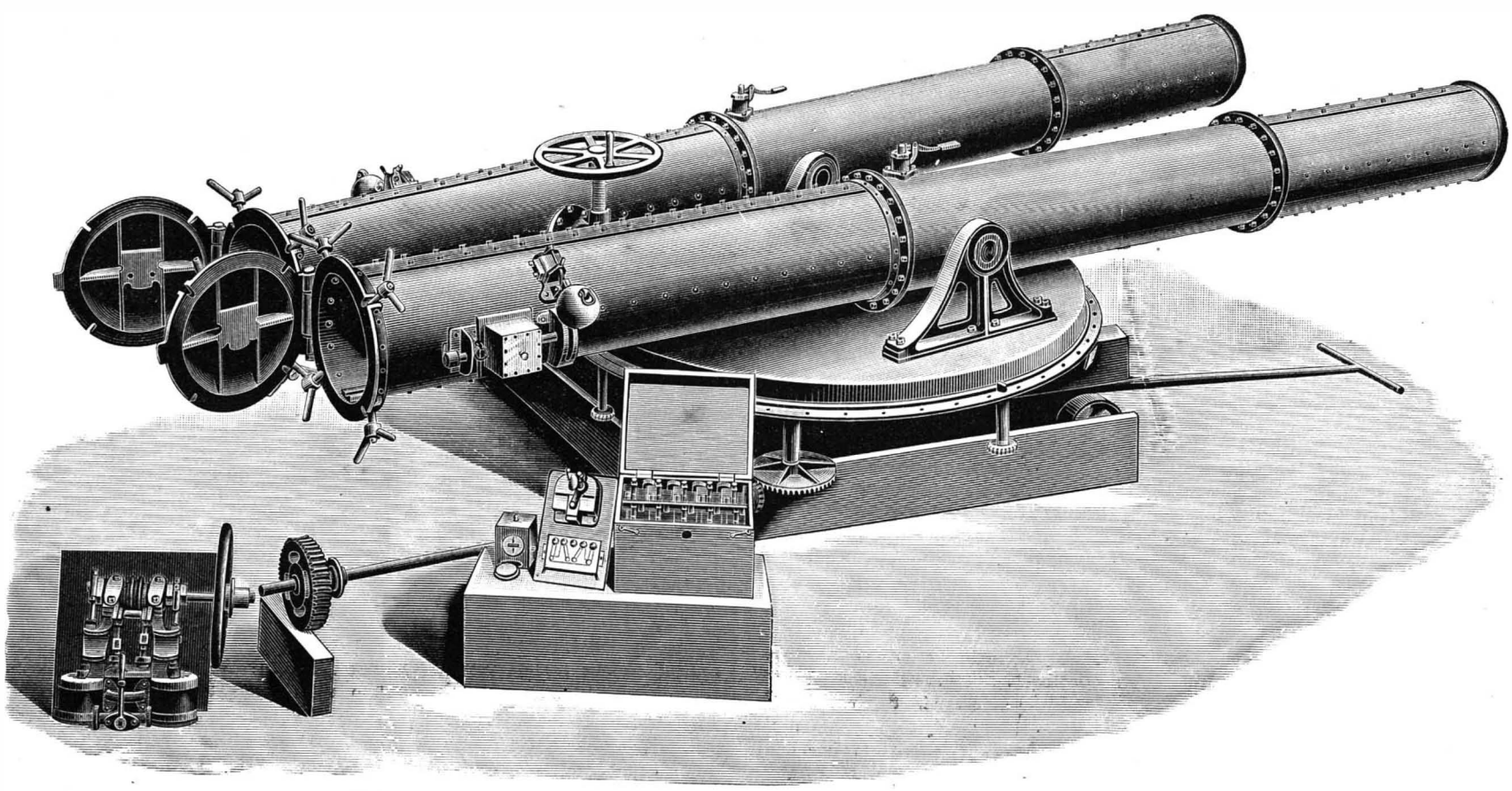
The electrical sun is a big ground glass disk, with a voltaic arc lamp behind it of about 2,000 candle power, connected with the street circuit. It shows through a hole cut into a drop curtain, and is set firmly in a frame covered with colored gauze to represent the various hues with which it tinctures the atmosphere and the colors it projects upon the clouds during ascension and declination. One of the best effects yet had with this artificial sun is in Myerbeer's "The Prophet," act III., scene 1. The Anabaptists are encamped in a Westphalian forest near by a frozen lake that loses itself in the mist gathered at the horizon (also an electrical effect). The day is going down in the west with the sun. The fierce arc lights are moderated through golden gauze, then softened by the ground glass outside.

As the sun is let down behind the paper mountains, the purple and red gauze is pushed up over his face, and the lower clouds, now changed from cumulus to stratus, take on those horizontal lines of color we know so well. "Tannhaeuser," act III., scene 2, shows the mellow glowing of twilight, the masterful incandescence light, hooded in pale yellow, controlling the haze so well that in the expanse of mimic sky there is not a tint to dispel the illusion. The evening star in the southwest twinkles clearly like the ruby Mars. Wolfram, the minstrel knight, seems justified in his apostrophe:

"I look on thee, O star in heaven the fairest,
Thy clear-cut beam thro' trackless space thou bearest,
The hour of darkness is by thee made bright,
Thou lead'st us upward with kindly light."

This star (see Fig. 2) consists of a single 16 candle power incandescence light connected with the street circuit and affixed to a metal frame set in the drop curtain; only the star itself, with a covering of red gelatine tinctured with blue, showing through. In the duel scene in Gounod's "Faust," act IV., scene 7, will be found a striking electrical effect. As will be remembered, the soldier Valentine, brother to Marguerite, fights with Faust, the student and Marguerite's lover. As he is unfamiliar with the use of the sword, the Devil in the guise of Mephistopheles stands by, sword drawn, to aid him (see Fig. 1), interposing the weapon when Valentine makes too fiercely at the student. Heretofore, though there was a clash of swords, there was not here anything to indicate the possession of supernatural powers by Mephistopheles. The electric wires are connected with Valentine and Faust. The poles of the battery are connected under the stage with copper plates sunk into the flooring where the duel takes place. Copper nails driven, one into a shoe of Valentine, the other in that of Faust, connect up with the floor plates whenever they respectively stand upon them, and wires running up the legs and body of each and then down their several sleeves end in a small plug. So, when they draw their swords, they have but to insert these plugs into the holes sunk into their hilts and they are connected up with the electrical storage battery in the wings; Valentine representing the positive pole, and Faust the negative.

Every time Mephistopheles interposes his sword and strikes up the contending weapons, which are then brought in contact, the sparks fly furiously, and there are those weird, crackling, sizzling sounds heard in the lightning as well. When Valentine gets his death wound, he throws out the plug connecting his sword with the battery, by a simple turn of the thumb, and,



IMPROVED DIVERGING TORPEDO GUNS.—[For description see page 392.]

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as he falls, his sword flies from his hand with nothing to show the presence of any electrical connection.

Every one familiar with the charming music drama of Wagner's, the "Ring of the Nibelung," will recall that impressive scene in the first act of Siegfried where the stout lad Siegfried welds together the broken pieces of his dead father's sword which have been left him by his mother Sieglinda (see Fig. 6). The scene represents a cave in the rocks with openings into the forest. It is a smithy's forge, with fire, chimney, and bellows. The point of this scene lies in the prodigious strength of the lad Siegfried, who, because of it, succeeds where Mime, the smithy, has failed, and welds the terrible sword that is to kill the dragon who guards the treasure. The anvil upon which the lad strikes is connected by concealed wires with the storage battery, the positive plate being a corrugated piece of cast iron 6½ inches by 12, the negative pieces of iron wire three-sixteenths inch diameter and 12 long, bowed upward at their center and placed above and free of the corrugations below them. The current required being of 15 amperes, if the negative wires should rest upon the positive plate, a dead short circuit would be formed and all metal connection with the battery would be fused; but bowed as they are, there is but a momentary short circuit at each stroke of the hammer, when the springy wires are forced down upon the under plate, producing only a shower of sparks, as if from the great force of the blows struck. At last, when the sword is completed and a firm handle upon the hilt, he determines to test its temper, and raising it aloft brings it down with what seems a tremendous blow upon the anvil, which falls into two parts (see Fig. 7), as if cleft in twain, the sparks following the sword down to the ground. In reality, he strikes a spring which lets one-half the anvil fall, its under and outer side, as will be seen, having the corner cut off for the purpose and causing momentary short-circuiting.

A very pretty electrical effect is had in the garden scene in "Faust," act III., scene 6. Siebel, the would-be lover of Marguerite, advances to a bed of tulips (see Fig. 3), some red, some white, and some gold, to pluck a nosegay that he would leave upon her window to speak for him. Concealed in the corolla of each flower, or, rather, disguised as stamens and anthers, are two tiny incandescence lamps (15 volts each), the whorl of petals fresh and sparkling as when we see them fed with sunlight. Now, the demon Mephistopheles had long before warned Siebel:

> "Every flower that you touch
> Shall rot and shall wither."

Unheeding, Siebel picks a golden tulip which shines yet as he lifts it up to him (the fine wire carrying the electrical current that keeps the bulbs in the flower aglow, trailing after it, unseen amid the foliage). No sooner does he examine it, when, lo! Mephistopheles, partly concealed, raises his hand, the current from that single flame is cut off, and it grows dull and withers perceptibly. Siebel says:

> "What, faded! Ah me!
> Thus the Sorcerer foretold at the fair:
> That, should I touch a blooming flower,
> It shall wither.
> But my hand in holy water I'll bathe—
> See, now, will they wither?"

Here he plucks a red tulip, a white and a golden one, holding them up triumphantly, a rich, mellow glow in each (the electrical current following upward along the fine wire and the little bulbs yet lighted), for Mephistopheles may not raise his hand against the power of what's been blessed. Then he changes hands, and, like a flash, they fade; beaming with light again when he, remembering it was the other hand that touched the holy water, hands them back. (The operator, watching the scene, turning the electrical switch on or off as required.)

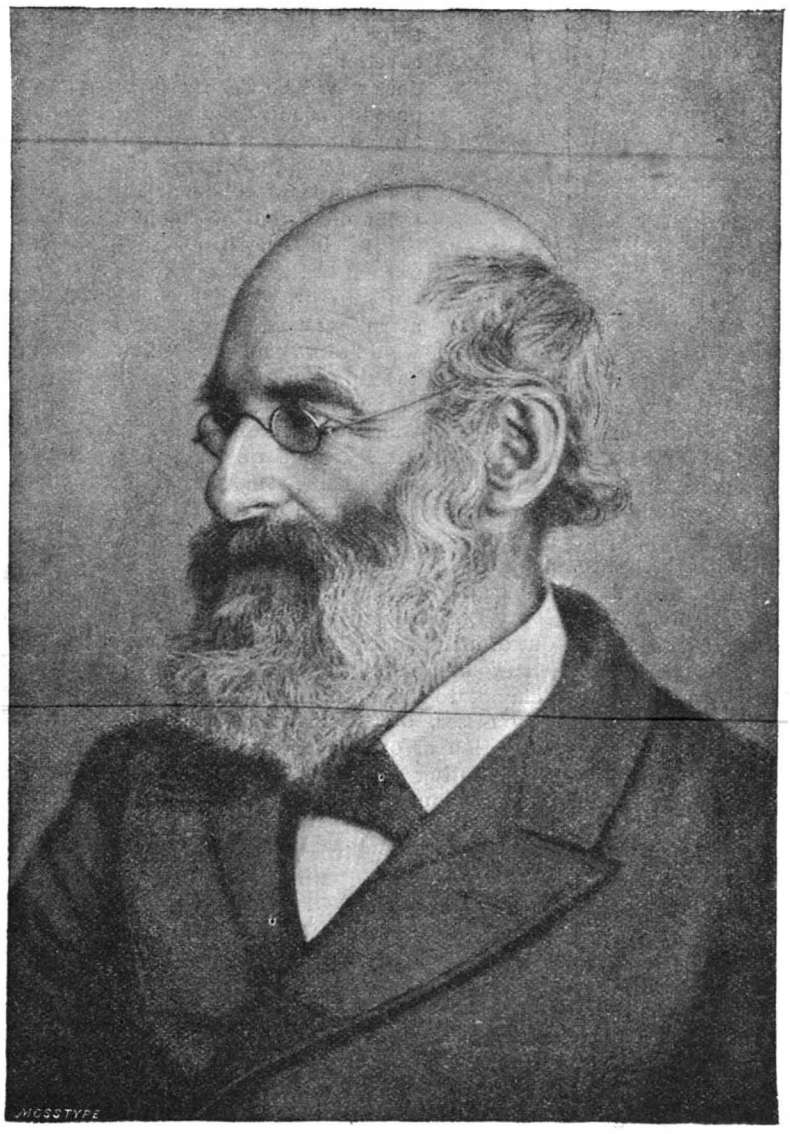
In the last act of Siegfried, the wanderer (Wotan) is standing at the foot of a high cliff, with a deal of thunder and lightning overhead. He is armed with a great spear, steel-tipped and pronged, with the wood of it studded with steel. It is supposed to contain the sacred though unseen fire, and heretofore, until the present application of electricity, there was no evidence of it, save Wotan's word. He, as guardian of the rocks, is pacing up and down, with the spear in his hand. Siegfried comes seeking Brynhilda's rock. As Siegfried approaches he draws his sword, dealing a heavy blow against the spear of Wotan, while, at the same moment, a man in the wings turns an electric switch. The spear parts, and from its shattered ends flames, like forked tongues, leap out. A lamp of 30 volts intensity is hidden in the spear; the core wrapped with heavy brown paper for insulation, with a mass of secondary cotton stuffed about the carbons at the point where the spear is to part. Then come thunder and lightning and black, rolling clouds, the last two projected upon the mimic sky by a stereopticon in the wings. The lightning and the clouds are scratched and painted on small bits of glass; before projection being greatly magnified by lensing, with a powerful voltaic arc electric light behind the condenser throwing them with wonderful precision and naturalness: the clouds rolling across an apparently immense expanse of sky, as the operator revolves the disks one over the other (see Fig. 8), and the forked lightning seeming to shoot across the heavens.

The realistic fire clouds and flames in the last act of the Prophet, where the latter, learning he is betrayed, orders the firing of the Palace of Munster, are done by concentrating the arc light upon colored gelatine; using first yellow for fumes, then yellow and white, then yellow and red, red and white, red and black. The snowstorm in the Prophet is made by forcing the light through white scratches on black glass. The sandstorm in last act of the Queen of Sheba is done with yellow and black and pink gelatine before the light, and the rain by parallel scratches on a black surface; the arc light being dimmed and set aglow alternately, and the glass turned this way and that, so that the parallelism of the drops shall follow a supposititious changing of the direction of the wind.

The firefly (Fig. 10) is another fine effect, devised by the same hand as the others, and recently used at the Broadway Theater, in the play of the Kaffir Diamond. Tiny 15-volt incandescence bulbs were affixed to the weeds and rushes in a swamp, each bulb getting its life from a fine wire connected to an electrical accumulator in the wings. The operator in his hiding place, by pressing upon the knobs of his key board alternately, lighting up one and then another, could make a single firefly appear to be darting hither and thither, then there would be two of them, a half dozen, a score, or, pressing upon all, twenty-eight.

The artificial rainbow (Fig. 9) is made by the interposition of two triangular glass prisms, one elevated slightly over the other, before an electrical reflector, the bases and faces and lateral edges carefully adjusted with regard, the one prism to the other. The electrical sun, set opposite to the point where the rainbow is to appear, is made, the better to aid the illusion, to shine into a mass of cloud, the rainbow being seemingly only the reflection, refraction, and disintegration of sun rays into the various colors of the prismatic spectrum, the influence of the rain drops. So ingenious is the work, that there is made to appear, as in nature, two arches, the primary with its inter circle of red, and the secondary with red along the inner.

In the Valkyr, an incandescence light is thrust into a knot in the tree and, shining upon the hilt of the sword, discovers it to Siegmund.



ROYAL E. HOUSE, THE ELECTRICIAN.

## ROYAL E. HOUSE, THE ELECTRICIAN.

BY H. C. HOVEY.

In a pleasant home in the city of Bridgeport lives a veteran inventor, whose name has long been associated with the honored names of Henry, Morse, Vail, and other pioneers of telegraphy, and which has lately gained new publicity from the fact that he contests with Professor Bell the priority as inventor of the telephone. Keenly watchful of passing events, he has hitherto been unwilling to allow any sketch of his life and services or any portrait of himself to be published; and it is only at the urgent request of his friends that he permits the printing of this communication.

Royal Earle House was born in Rockingham, Vt., September 9, 1814. In 1840, he invented and put in operation a water wheel that would work under water, and not freeze in winter, and yet do the work of a gravity wheel with its gearing. This he accomplished by using a spiral conduit, with cover, inclosing a vertical wheel with two sets of buckets; one set arranged around its side, to have motion from the inflowing water, the other arranged to cover the bottom, each bucket having a suitable angle to utilize the centrifugal force of the whirling water, and its weight, by causing the water between the vertical buckets to move backward and be discharged in a direction nearly opposite to that of the water in the spiral conduit, when, relatively, the outflowing water is in a state of rest. The principle of the turbine wheel had long been known abroad; but House's invention lay in such a combination of the impulse and discharge as should make the wheel of practical value, and his ingenious contrivance is now extensively used in various forms and known by different names.

In 1842 he resolved to devote his life to the study of electricity, and to give popular lectures, with accompanying experiments. After a brief career in the lecture field, he decided, however, to limit his attention to the more promising arena of invention. A brilliant galaxy had already preceded him. Morse had taken out his earlier patents, but had not yet built the first electro-magnetic line—from Washington to Baltimore—when House conceived the idea of his printing-telegraph. He made his first instrument of the kind in 1844, and exhibited it before the Mechanics' Institute, in New York City. It received a gold medal from the American Institute in 1848, with a special compliment on its being "an invention of great ingenuity." The committee of award were Professors Agassiz, Chilton, and Renwick. Morse's telegraph conveyed intelligence by preconcerted signals, dots and lines made by breaking and closing the circuit. House's telegraph printed its messages in Roman letters. The component parts were type wheels, platens, a keyboard like that of a piano, and a single line of telegraph. The type wheels moved synchronously by a step-by-step motion, arrested at will by pressure on a key, causing its representative letter to be printed. The actual speed attained was at the rate of fifty words a minute, or equal to the average speed of the modern typewriter. This was more rapidly than work could be done by the Morse instrument; but the printing-telegraph required more power to move the type wheels, etc., which became an objectionable feature when stations came to be multiplied.

Professor House removed with his family to New York City, in 1844, and sold a half interest in his invention to Mr. William Ballard, who was financially associated with him in making instruments and laying lines. Hon. Samuel Selden and Mr. Hiram Sibley, of Rochester, were also interested. Mr. Henry O'Reilly made an agreement for the use of the printing-telegraph throughout the West. He located the first telegraph line of any sort between Pittsburg and Cincinnati. Afterward he located an instrument at New Albany, Ind.

Capital was subscribed for building a line from New York to Philadelphia. This line crossed the North River at Fort Lee. On the east side was a mast 300 feet high, and on the Palisades, on the west side, one 200 feet high, making an eminence 400 feet in height. The contractors had faith in a small wire cable of seven twisted strands. But in practice this gave much trouble, and a solid wire had to be substituted. The right to use the printing-telegraph between New York and Philadelphia was sold for $25,000 in stock, and for $30,000 the right from New York to Boston.

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An arrangement was next made with Judge Selden and Mr. Edson to extend the invention to all the principal cities of the United States, and to build 600 miles each year, or to forfeit $10,000 to liquidate annual damages. Under that contract a line was built from New York to Buffalo, with an iron wire having 600 pounds to the mile, for which the patentees received $100,000 in stock. About that time the Morse company filed a bill for an injunction to stop the House line from New York to Boston. Up to that date all suits had gone in Morse's favor, and it was confidently expected that the injunction would be granted. The counsel employed on the House side were George Gifford, Rufus Choate, and Charles L. Woodbury. After hearing very exhaustive testimony, the judge decided that the House telegraph was no infringement. The favorable termination of that suit (which was never appealed) gave value to the invention.

A new era was introduced in telegraphy when the messages came to be received by *sound only*, the operator writing them off rapidly in a suitable form for delivery. Professor House saw the need of more sensitive apparatus for the transmission of sound waves. Taking up the subject where Boursal and Reiss had discontinued their researches, he made and had patented an "electro-phonetic telegraph," June 27, 1865, and in order to improve the workings of certain parts took out another patent, May 12, 1868. The invention consisted in placing at each station of the line a hollow ear piece for receiving sound waves, this being closed at one end by a thin flat plate, or diaphragm, having a spring force to counterbalance the magnetic force of the armature, and thus hold the sounding head in a state of magnetic equilibrium when the circuit is closed. There was also a device for adjusting the loudness of sounds.

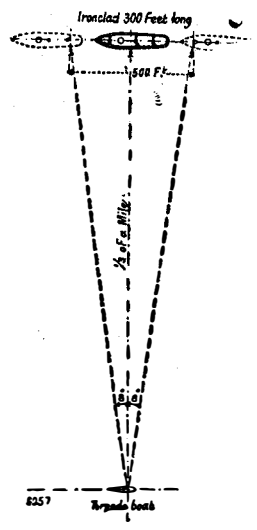
The inventor's idea was simply that of making an instrument of great sensitiveness for receiving the sound signals of letters used in telegraphing. But the instrument is really a *telephone*, doing as good work as can be done by the more recent Bell telephone. The Supreme Court has decided that "a patentee is entitled to all the benefits which result from his invention, whether he has specified all the benefits in his patent or not." Hence Professor House justly regards the Bell telephone as an infringement on his patent, and has called the attention of the American Bell Telephone Company to his claims. It is not my intention here to argue the case, but merely to state the facts as given to me. I may add that, in company with others, I have experimented with the original "electro-phonetic telegraph," made exactly according to the patent drawings, and with the modern House telephone, and also with the Bell telephone put in connection with the House, and found no difficulty in transmitting and receiving vocal messages with entire and uniform clearness. The inventor specified in his patent of 1868 that diaphragms as large as eight inches might be used. To test this Professor House produced a pair, of the size stated, made of pine wood, and the result was most remarkable. The messages were distinctly audible when the speaker and hearer each stood five feet away from the instrument; and when several persons carried on a conversation in the room, it was all transmitted perfectly to the other end of the line. Let the reader note the fact that every detail of the mechanism of these extraordinary telephones was covered by the House patent of 1868, granted eight years prior to the Bell patent of 1876, and observe the remarkable fact also that neither House nor Bell specially claimed that their instruments could "talk."

The "automatic telegraph" remains to be described in recounting the services of this eminent inventor. When business increased so that many million messages went over the wires every year, it became evident that there must be a wasteful multiplication of poles, wires, instruments, and operators, or else that in some other way the cost of sending a telegraphic message must be reduced to a minimum. House undertook to meet this demand by a system of his own. He invented a new, time-saving alphabet, in which a message may be prepared for transmission. When thus prepared it is sent over the wire with greatly augmented rapidity, and is transferred from line to line without having to be repeated. "Untouched by an operator, the message is automatically received and translated into ordinary printed typography ready for delivery, while automatic machinery, without the aid of an operator, takes care of and files away the paper of the transmitted message." So ingenious is this device that a series of messages on a single line may be sent as one message, and each be automatically dropped at its destination, and the capacity of a single wire will exceed the ability of six operators to prepare messages, each of which in its turn may be started by a slight movement of the hand. And this system does not interfere with the use of the wires, on occasion, in the ordinary way. This improved system, so far as it may be adopted, must give us one of the great demands of the age—rapid and cheap telegraphing.

In 1884 Professor House and his wife removed to Bridgeport, Conn., where two of his nephews reside, who are also known as successful inventors. The fact that he was brought up amid the rugged fields of a mountain farm, while having some disadvantages, enabled him to start in life with strong physical powers, as well as a healthy and vigorous mind. The result is that now, at the age of seventy-four years, Professor House enjoys uniform health, and his memory holds tenaciously the diversified facts of his eventful career.

## DIVERGING TORPEDO GUNS.

We give a perspective view of a pair of torpedo tubes which are arranged in a manner introduced by Messrs. Yarrow & Co., of Poplar. It will be seen that the two tubes, or guns as they are generally called, are set at an angle to each other, so that if a torpedo be ejected from each one simultaneously, the two missiles will travel in diverging courses. The object of this is to afford a better chance of the enemy's vessel being struck. Below we give a diagram of a 3-gun arrangement which is an extension of the same principle. In illustration of the effect of this arrangement, we will suppose the ship attacked to be 300 ft. long. At about one-third of a mile, which is approximately the effective range of the torpedo, the line of attack covered by the three torpedoes would be 900 ft., as opposed to 300 ft. to only one of these weapons discharged; that is to say, the ship would not escape were she at any point on a line of steaming 900 ft. in length measured normal to the axis of the center gun or parallel to the attacking vessel's keel. There would also be a chance of two of the weapons striking the ship simultaneously.




It may be objected that this arrangement entails an extra expenditure of torpedoes for each discharge. No doubt this is true, but after all the question to be settled is whether in an engagement more torpedoes would be effective with a given force of torpedo-firing vessels than if the old system of single discharge were adhered to. The recent naval maneuvers have shown the value of torpedo attack—in spite of a popular belief to the contrary—but still there were not many hits scored out of a comparatively large number of tries. Mr. Yarrow claims that with his system there is an additional chance to strike an effective blow when the opportunity arises, but in any case the officer would have the option of only firing one torpedo, and so be on the same footing as if his ejecting tubes were arranged on the old plan. But three torpedoes are a small price to pay for the destruction of almost any vessel, and the diverging fire gives so immeasurably a greater chance of success, that it would be seldom that the risk of extra expenditure would not be warranted.

It is of the essence of successful torpedo attack that it should be sudden, and that the blow, when struck, should be overwhelming. In times of excitement and danger an officer, be he ever so brave, is not likely to make very good practice with so uncertain a weapon as the fish torpedo. It is a difficult thing to aim even under favorable conditions, but here a fair approximation to accuracy may afford success.

The torpedo is ejected by a small charge of gunpowder in the way that is now usual. The officer in command settles the angle at which his tubes are to be set before going into action, and the pointing is then done by maneuvering the boat. The elevation is also decided beforehand, and the guns pivoted on their trunnions by the horizontal wheels shown. For instance, it is determined beforehand whether the torpedoes shall be fired while the attacking vessel is approaching or leaving the enemy, and the guns are then trained before or abaft the beam, or of course a beam attack may be made, as shown in the diagram. The officer has, therefore, nothing to attend to but the steering of his vessel, and fires his weapons when the propitious moment arrives.

The arrangement is intended both for torpedo boats proper and for any larger vessels. Applied to the former, it has an additional advantage over the old plan adopted with the first-class English boat. By reference to our engraving of one of these vessels, shown in our issue of April 29, 1887, it will be seen that the two guns are placed one on each side of the conning tower. This has been found in practice very inconvenient, as the deck room is obstructed in a serious manner. With the diverging guns this difficulty is got over.

In our illustration the mechanism by which the necessary operations are performed is partly shown. The torpedoes are fired electrically by a "make-and-break" contact. The magnet is contained in a box, and this withdraws the bolt which allows the weight to fall, thus making electrical communication with the fuse in the discharging cartridge. The switch by which these operations are set in motion is placed in the conning tower. The tubes are traversed by hand, but steam gear can be fitted if required.

The arrangement has been adopted by the Admiralty for the new Sharpshooter torpedo gunboats. A number of sets have also been supplied to the Italian government, while there appears a probability that it will be fitted in other directions.—*Engineering.*

### Mr. James S. T. Stranahan.

A dinner was given by the Hamilton Club of Brooklyn, N. Y., on December 13, in honor of one of her oldest and most distinguished citizens, Mr. James S. T. Stranahan. He has long been a representative of all that was best in the advancement of his city and time, and now at the age of eighty looks back upon a residence of nearly fifty years in the city of his choice. Some of his remarks made at the banquet have a peculiar interest. In the course of his address he said:

"I came to this city in 1844 and have since continued to reside here. There is no spot on earth to which I am so strongly attached as to the city of Brooklyn. The first enterprise in which I engaged on coming to Brooklyn was the Atlantic dock. In 1870 the first dividend was paid, twenty-six years after I engaged in the work. The second enterprise in which I was interested was Prospect Park. All the members of the original park commission, with the exception of myself, are sleeping in Greenwood.

"The third project that interested me in Brooklyn was the Brooklyn bridge. No one can but acknowledge what the great structure owes to Henry C. Murphy and William C. Kingsley, both of whom sleep in their graves. There are two others, the Roeblings, father and son. The first lost his life, the second his health, in the building of the structure.

"Brooklyn and New York are two municipalities. Is this an advantage? I think not. Would the consolidation involve any harm to either? I think not. The people in both cities are alike in sentiment and feeling and have about the same interests. One municipal government could be carried on at less cost to taxpayers. I may be mistaken, but I think that the people of both cities should consolidate under the name of New York. (Applause.) London is London on both sides of the Thames, and Paris is Paris on both sides of the Seine. The East River bridge, added to the ferry system, will so affiliate the two cities that both will alike ask the legislature of the State to enact a municipal marriage."

The dinner was attended by a company of 167 leading citizens, representing the bar, the pulpit, and other professions, as well as the business side of life.

### Anthrarobin.

At the recent meeting of the American Dermatological Association, Washington, Dr. Bronson read a paper on a new remedy which he said was manufactured by Liebermann, a Berlin chemist, and was first employed on theoretical grounds, on account of its resemblance to other remedies of known value. Alizarine belonged to the same class, and from this anthrarobin was formed by a simple process of reduction. It was a powerful oxidizing agent, one gramme taking up 120 c. c. of oxygen. It was a yellowish white, granular powder, sparingly soluble in chloroform and ether, readily soluble in alcohol and weak alkaline solutions. It mixed readily with fats in the formation of salves. The presence of an alkali increased the reducing effect. The author had treated cases of psoriasis at the Charity Hospital, applying anthrarobin on the right side of the body and chrysarobin on the left side. It was used in a ten per cent mixture with vaseline, and once a day an alkaline bath was given before the application. Out of the eight cases treated, the first five had been somewhat surprising. Improvement had begun sooner and gone on more rapidly on the right side, but after the applications had been stopped there had been more recurrences on the right side.

In the three other cases the alkaline baths had been omitted, and the improvement had been more marked on the left side; but as soon as the baths had been commenced, the right side had begun to improve more rapidly. The staining was of a dark brown and deeper than with chrysarobin, but it was limited to the area to which it was applied. In only one case, and when a twenty per cent application had been made, had it been irritating. In a very marked case of eczema seborrhœicum the effect had been very marked. It had no antipruritic effect. In diseases in which the indication was for a purely keratoplastic agent, or in such conditions as obtained in the old stages of eczema, there was reason to hope that the new remedy might render considerable service.

### Railway People Must Carry Good Watches.

The Rock Island road has notified its employes that, commencing December 1, 1888, each conductor, engineer, yard master, train dispatcher, section or bridge foreman, and officer connected with the operating department, and all employes in responsible positions as to the running of trains, will be required to carry a watch of a certain standard excellence, and shall have their watches examined by the company's examiner for certificate as to condition and quality, and once every three months thereafter.

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### EXPERIMENTS ON DEATH BY ELECTRICITY.

Some experiments on the effect of electricity upon animals, with a view to determining the best method of inflicting the death penalty on capital offenders, were performed on the 5th of December at Mr. Edison's laboratory in Orange. Mr. Harold P. Brown was in charge of the work.

A calf weighing 124½ pounds was first subjected to the current. An alternating current of about 50 volts E.M.F. was first applied, which caused the animal to fall, but nine minutes afterward it rose to its feet apparently uninjured. The current was then brought up to 770 volts E.M.F., and was applied for eight seconds. The animal died, and as far as could be ascertained, the death was absolutely instantaneous. On dissection the brain vessels were found filled with blood, but no hemorrhage was discernible; the heart and lungs were normal. The hair on the forehead was slightly scorched where the metal parts of the electrode came in contact with it.

A second calf, weighing 145 pounds, whose resistance between the electrodes was 1,300 ohms, was subjected to a current of 750 ohms E.M.F. for five seconds. Again death was instantaneous, the heart at once stopping.

Next a horse weighing 1,230 pounds, halter included, was subjected to the experiment. With the connections made as shown in the cut, the resistance was found to be 11,000 ohms. The current was used at about the same potential as before, but as the voltmeter had broken down, the electromotive force could only be judged by the degree of illumination which it imparted to a series of lamps. A single tap of the hammer was used to close the circuit, but the animal was little if at all affected. The current was then applied for five seconds, and again for fifteen seconds, and in neither case was the animal injured apparently. Finally the current at a full potential of 700 volts, estimated, was applied for twenty-five seconds. During this time steam was evolved from the electrodes, showing insufficient metal contact. Death was produced instantly.

The methods of connecting the wires to the animals were two: In the cases of the calves, ordinary medical electrodes were used. One was applied to the forehead, the other just back of the shoulders, in order to bring the brain into the direct line of conduction. The forehead electrode was circular, two inches in diameter, and was covered with sponge; the other electrode was four inches long and two inches wide. Both were covered with sponge, which was saturated with a solution of zinc sulphate of specific gravity 1·054 at standard temperature. A portion of the skin, where the electrodes were to be applied, was freed from hair by clipping with scissors. The burning of the hair in the first experiment was undoubtedly due to incandescent and not to arc action.

In the case of the horse, the legs were wrapped with wet waste, and around this the wires were wound directly. One conclusion that these and other experiments lead to is that the resistance of the animal is due in great measure to the perfection of the contact with the skin. Perspiration favors the contact and lowers resistance. Another conclusion is that the current should be applied so as to have the brain in its direct course. A distinct difference is noted between the action of the alternating and the direct current. The alternating current seems to produce a kind of paralysis or tetanic condition, in which the animal struggles very little, while the direct current brings about contortions which may become very serious and powerful.

The experiments were executed under the auspices of the Medico-Legal Society of this city. The importance of determining the best method of inflicting death by electricity arises from the new law of the State of New York, which goes into force after the first of January. This law substitutes death by electricity for death by hanging as the statutory punishment for capital offenses.

The recommendation of the committee, which, in September, had been charged with especial consideration of the question, advised the use of the alternating current of 1,000 to 1,500 volts E.M.F. and with alternations of not less than 300 per second. The current, the report stated, should enter the person by metal electrodes from one to four inches in diameter covered with thick layers of sponge and chamois skin moistened with a weak aqueous solution of common salt, and the sitting position was recommended.

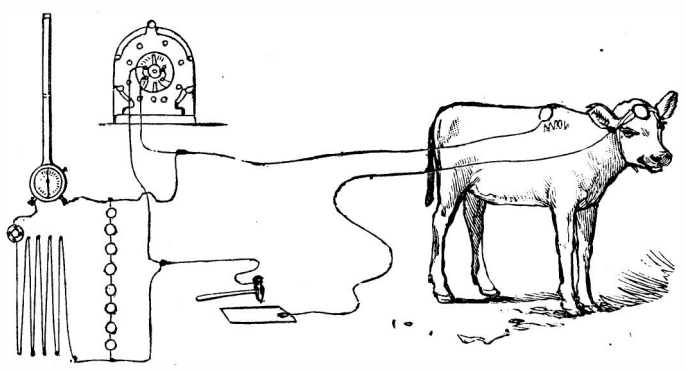
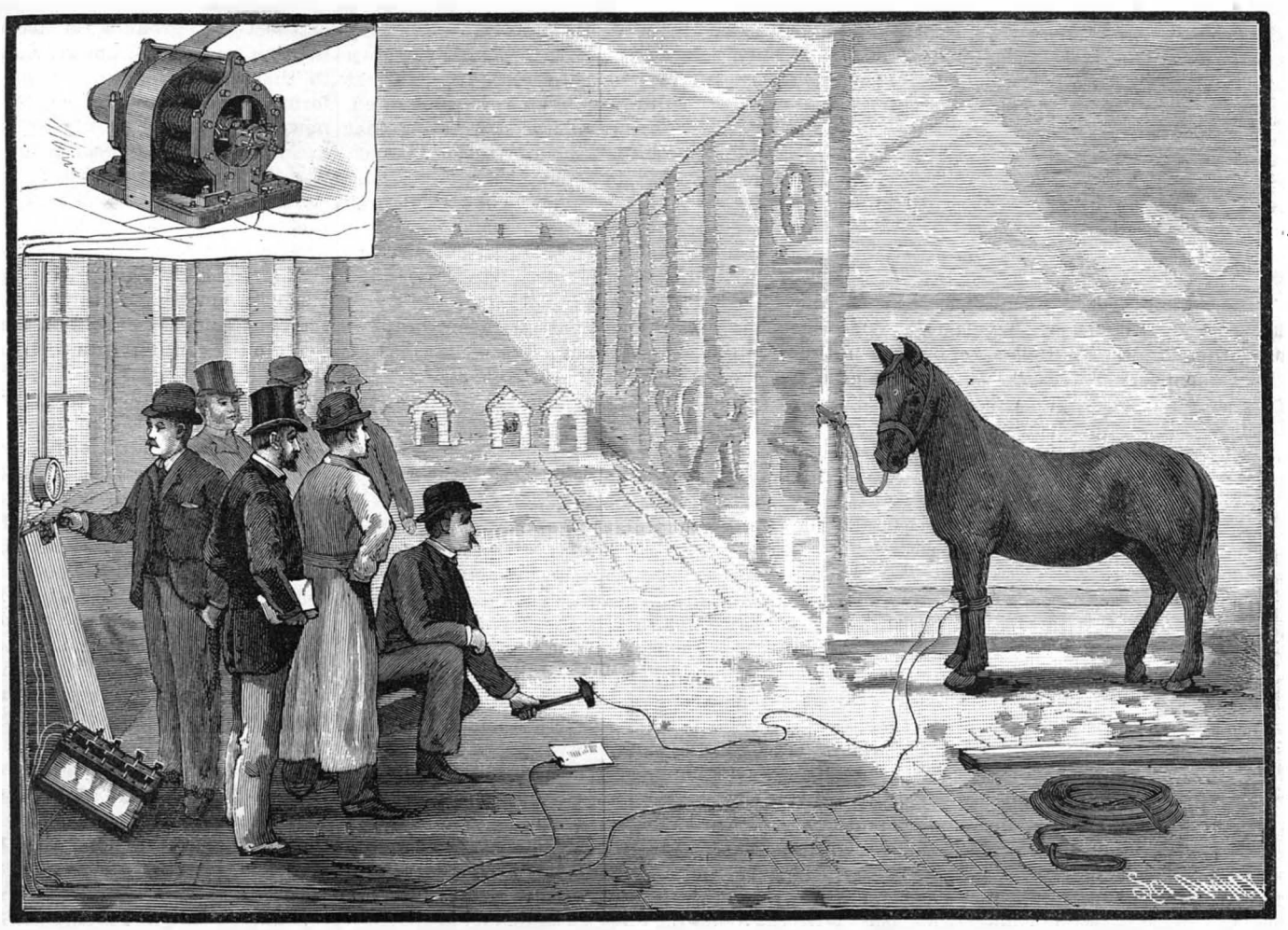


DIAGRAM SHOWING METHOD OF CONNECTING BATTERY AND SUBJECT.

The measurements were made by Mr. A. E. Kenelly, of the Edison laboratory. It will be noticed in the diagram of the electric connections that a series of lamps were arranged in parallel with the voltmeter and its resistance. The lamps in this position acted as an adjunct to the voltmeter, giving ocular evidence of variations in electromotive force, and affording in themselves an approximate measurement of the same factor. They were utilized after the breaking down of the voltmeter as already described.

It is now proposed to kill an elephant by electricity, not, however, by the Medico-Legal Society's representatives. The elephant Chief, the largest in the country, has become so dangerous that his death has been decided on. It is proposed to apply electricity. Whether the idea will be carried out remains to be seen.



EXPERIMENTS IN KILLING ANIMALS BY ELECTRICITY, AS CONDUCTED AT ORANGE, N. J.

### A Good Trade to Learn.

There are very few young men who start out in life but what do so with the intention of doing something that shall furnish them a means of livelihood and something more, which they may look to in case there comes a time when they cannot do so. It is of course desirable to do that which shall be the most sure of bringing about this object, and it is a most important thing that the young man choose that in which there is the best chance for the accomplishment of this end.

There are few trades to-day that offer better advantages in this direction than the machinist trade. As a rule, they are a better-paid class of men than almost any other, and the chances for advancement are more numerous than elsewhere. The young man who starts in to learn the machinist's trade has a broad field for development. Upon this trade more than upon any other depends the prosperity and wealth of our country. There is a constant and increasing demand for new and improved mechanisms, and it requires the genius and ability of good machinists to furnish this demand. Then there is also the great field of invention, that opens up an unexcelled and exhaustless chance for the ambitious and ingenious mechanic. That there are "millions in it" is emphatically evident from the examples before us. Nor is it absolutely necessary that a man shall be an expert. Some of the most valuable and most profitable inventions have been those worked up by men who were not experts, and who were scarcely well versed in mechanics to be valuable workmen.

That many inventions are valueless, we do not question, but that is not always a direct indication that they are worthless or unimportant as an invention. The one great aim in this line should always be to produce an article which is at once simple and possessing some features of novelty or value over any similar existing device. Another reason why we would consider the machinist trade a good one to be taken up is because it is principally upon this that the country depends for its wealth-producing forces, and while this state of things lasts there will always be a demand for good workmen. A thoroughly good machinist is seldom out of a job, and so far as statistics show, there are less labor troubles arising in this than in any other line.—*Practical Mechanic.*

### Rotary Veneering Machines.

According to the *Northwestern Lumberman*, the largest machine for cutting veneers in the United States is in operation in California, and shaves up logs ten feet eight inches in length with the greatest ease. The shavings which come from these machines are great, long sheets, in each of which is almost the entire wood of a big log, and from a single shaving is frequently made from 2,000 to 5,000 berry boxes. The logs are first cut into the desired length, then placed in a large steam box and left for twelve hours, subjected to the effects of exhaust steam, which so softens the wood that it can be cut into the thin sheets desired, without checking or splitting into fragments. When sufficiently softened, the log is pushed into an immense lathe and revolves in front of the great blade exactly as a strip of wood in a turner's lathe revolves toward the chisel. After the water-soaked outer portions of the log have been trimmed off, a number of small, chisel-like instruments are adjusted, with the sharp cutting edges pressing against the log, which make parallel lines, partially cut through, the whole length of the great white, steaming shaving. These lines are the points of bending when the boxes are formed, and make that operation nothing more than a simple mechanical movement, as the wood bends readily at the partial cuts, and forms the angles of the box. All but the core of the log is turned off into this long shaving, one-twentieth of an inch in thickness and nearly one thousand feet long, which is folded and broken into convenient lengths for handling as fast as it comes from the knife. These are then cut into narrow strips, lengthwise, and of the proper width for the sides and bottoms of a berry box. The last step in the manufacture is the fastening of the bottom and side strips together, which is done by a peculiar-looking machine called a stapler, but which might properly be called a wire-sewing machine.

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## RECENTLY PATENTED INVENTIONS.

### Engineering.

LOCOMOTIVE BOILER.—Charles S. Smith, Pocatello, Idaho Ter. This is a boiler with an attachment whereby a portion of the exhaust steam may be utilized in the boiler furnace for completing the combustion of the fuel and preventing the escape of sparks and cinders, the exhaust being connected with the discharge end of some of the boiler flues.

AIR BRAKE.—George B. Williams, La Crosse, Wis. This brake is designed to reduce to a minimum the waste air from the train pipe when air from an auxiliary reservoir is used for applying the brakes, the invention covering novel details of construction and arrangement of parts, as improvements on Westinghouse brakes.

PULVERIZING MACHINE.—James W. Hilton, Brooklyn, N. Y. The machine has a cylindrical casing closed by end heads, each having axial tubular bearings connected with a hopper, there being feed screws in the tubular bearings, and the drum having outer curved pockets and screens, and a solid central portion provided with pulverizing surfaces or rings and pulverizing rollers, being adapted for pulverizing ores and for other uses.

FEED WATER HEATER.—J. Thomas Lee, Mattoon, Ill. A water jacket diaphragm, or heat deflector, is held in the smoke box of the boiler and connected with an injector or pump, while a water jacket surrounds the stand pipe and is connected with the water jacket diaphragm and the interior of the boiler, thus utilizing the heat of the escaping smoke and gases and of the exhaust steam.

### Agricultural.

MOWING MACHINE.—George W. Maxwell, Homer, Neb. This invention covers novel features of construction and combinations of parts whereby an even movement of the cutter bars is secured and all complicated mechanism is avoided.

FERTILIZER DISTRIBUTER.—John M. Howell, Jr., Donaldsonville, La. It has a hopper through which passes the wheel axle carrying a toothed cylinder, a slide or valve being arranged in a chamber extended to and below the hopper, the chamber having on its under side a two-armed conductor, while the valve is operated by a lever having adjustable connection with the hopper, for distributing a given number of pounds of fertilizer to the acre.

OSCILLATING SULKY HARROW.—Calvin H. Weeks and William Sellers, Haverhill, Mass. The harrow is pivoted at its center of gravity, and so balanced that but little power is require to oscillate it, the worm-like passage of the harrow teeth through the ground being designed rather to lighten the draught of the machine, while doing the work with one passage of the machine, so that cross-harrowing is unnecessary.

POISON DISTRIBUTER FOR PLANTS.—James T. Gramling and Alfred A. Adler, Mayersville, Miss. The crank axle on which are the supporting wheels and frame is bent up in the middle high enough to pass over the tallest branches of cotton, and the frame carries powder-dusting devices for sifting Paris green or other powdered poison upon growing plants, such as cotton, potatoes, etc.

HARVESTERS.—Dennis H. Bennett, Allendale, Mich. This invention covers an improved cutting apparatus for harvesters, particularly providing convenient means for securing the knives to the cutter bar, while the cutters may be readily removed when desired by giving the button a quarter or a half turn, and when replaced be secured by reversing the movement.

CULTIVATOR.—Clinton Mendenhall, Martinsburg, West Va. It is made with a wheeled frame having a series of inclines at its forward end, upon which a shaft is supported to travel, the shaft having plows connected thereto, while there is a lever for operating the shaft, by means of which the plows may be lifted out of the ground, and means for regulating the depth of the plows, the machine being adapted for cultivating various kinds of grain, and for use on stony or stumpy ground.

### Miscellaneous.

RATCHET MINING DRILL.—William A. Gentry, Trenton, Ga. The tubular stock of the drill has a socket at one end to receive the drill and a socket at the other end to receive a nut through which the feed screw works, the feed screw being steadily guided within the tubular stock, and with its nut being conveniently reversible, saving time and promoting durability.

TAMPING TOOL.—Warren B. Waldron and George C. Boller, Folsom City, Cal. This invention provides a spear attachment which may be readily adjusted in place or removed from the socket of the tamping tool, the spear being of any desired shape, and preferably of plate steel.

LIFTING JACK.—J. Merritt Smith, Greenwich, Conn. The standard has a lateral vertical slot through it, and at one edge a series of downwardly inclining branch slots or pockets, forming rests for the fulcrum pin of a curved operating lever arm, with other novel features, making a jack more particularly designed for lifting carriages.

LEVELING INSTRUMENT.—Aaron T. Binkerd, Allegheny, Pa. This is a combination instrument mounted on a stock, from which swings a gravity pointer, a degree scale being on the stock, and an arm pivoted to the stock, on which arm a compass is mounted to turn provided with folding sights, the instrument being adapted for leveling, obtaining angles, and sighting distant points.

TANK VALVE.—James Cavanagh, New York City. This invention covers a novel construction, combination, and arrangement of parts producing a cheap and effective inlet cock for closet tanks.

CHISEL GAUGE.—Aaron T. Binkerd, Allegheny, Pa. This is a device adapted for attachment to an ordinary chisel to guide the latter while cutting hinge-receiving recesses in doors, sashes, etc., and is made with two plates, one adapted to rest on the wood to control the depth of cut, and the other forming a stop to limit the instroke of the chisel, fastening devices holding the plates to each other and to opposite faces of the chisel blade.

HAY SLING.—Jay Toney, Omaha, Neb. It is made with two ropes united at their ends in rings, in connection with a coupler formed with a bail, through which the elevator rope passes, and having pivoted jaws and a sliding block, whereby the pull on the elevator rope draws the sling firmly upon its load.

PULLEY.—Jay Toney, Omaha, Neb. This invention consists principally in combining with the frame of the pulley a detachable head or knob, so that the pulley may readily be provided with a head of any size required for any hay carrier, being designed more especially for use in connection with heavy forks or unloaders.

VEHICLE WRENCH.—Egbert W. Hemans and Eugene C. Thayer, Aurelius, Mich. This wrench is designed to provide a means whereby the axle nut may be removed or replaced by the motion of the wheel, and when the wheel is removed from the axle the nut will remain in the hub in position for replacement.

BRAKE FOR VEHICLES.—William R. Wilcox, Portland, Col. This is a lock brake, whereby the vehicle will be held secure in ascending and descending a steep grade, the axle of the vehicle having a rock shaft journaled thereon, with a lever attached to one end of the shaft, lugs projecting from the shaft, and fork-like brake bars pivoted to the lugs.

GRAIN WEIGHING SCALE.—Henry Cutler, North Wilbraham, Mass. This scale is automatic in operation, delivering the weighed grain to the bags, and is simple and durable in construction and not liable to get out of order, the invention being an improvement on a former patented invention of the same inventor.

MAKING PICKETS OR SHINGLES.—Noah A. Acuff, Hall's Cross Roads, Tenn. This is a machine for pointing pickets, shingles, or similar articles, providing therefor an apparatus that will occupy but little room, and wherein each article will be shaped upon a uniform slope and pointed to the center of the material.

WATER HEATER.—William M. Barber, Fitchburg, Mass. This heater is designed to be safely utilized for heating houses and other structures, providing therefor an effective circulation, and affording a large amount of water with a maximum area of heating surface.

WASHING MACHINE.—Samuel J. Smith, Truckee, Cal. This is a machine in which movable rubbers are operated in conjunction with a stationary wash board in a water-containing tank, the rubbers being operated in series, whereby the clothes are kept from wadding up while the water is kept in rapid circulation.

GAUGE CHISEL.—Aaron T. Binkerd, Allegheny, Pa. This is a tool adapted more particularly for scoring or cutting recesses to receive the leaves of hinges, by which hinges of any size may be quickly set into work without the aid of compass, try square, or ordinary marking gauges.

DISTILLING TURPENTINE.—Joseph B. Underwood, Fayetteville, N. C. This invention covers a process of distilling crude turpentine in the presence of refined petroleum having about the same specific gravity as spirits of turpentine, or less, designed to increase the yield from a given quantity of crude turpentine and to improve the character of the product.

MAKING BOOT HEELS.—Antoninus Farina, New York City. An apparatus for forming a heel-shaped leather shell, and filling the shell with a solid body, is covered by this patent, which embraces novel devices for stretching and pressing the leather into the approximate form of the finished shell preparatory to moulding it, and for moulding and working the leather into the final shape thereafter.

DESKS.—John Thompson, Chicago, Ill. This invention covers an improvement in desks whose cabinets or pigeon hole portions are adapted to be first drawn partly out and then turned or swung one-quarter way around, increasing the facility of reaching their contents, and giving increased capacity.

BICYCLE.—Hiram F. Henry, Gowanda, N. Y. An arm is connected with the swinging part of the steering standard, while a spring is held on the fixed frame, its ends pressing against the arm, causing the steering wheel to return automatically to its normal position when turned out of a straight line, and holding it in normal position when the rider has his hands off the steering arm.

PAPER HOLDER AND CUTTER.—John Zerr, Keokuk, Iowa. This invention relates to roll paper holders with cutters for parting the paper by pulling it out sidewise, and covers special means for producing tension upon the roll of paper, which is cut after a sufficient length of paper has been drawn out from the roll for the purpose required.

PAPER FASTENING TOOL.—Thomas C. McCollom, Brooklyn, N. Y. This invention relates to an improvement in devices for applying the ordinary flexible T-shaped paper fasteners to the joining of paper sheets, and for removing them, the object being to secure greater simplicity, efficiency, and convenience in use than has heretofore been attained.

ALBUM CLASP.—Frederick Deck, Brooklyn, N. Y. A box, casing, or pocket is hinged to one cover of the album, and a plate enters the pocket having a threaded tongue engaging a milled nut in a through opening in the walls of the pocket, the plate having an aperture for engaging a stud on the other cover of the album, making a simple, convenient, and ornamental clasp.

PLUME.—Ralph W. E. Aldrich, Northampton, Mass. It consists of a central rigid core, to which strands of wool, hair, or similar material are secured at about the center of their length by the twist of the core, while a cap is attached to the upper end of the core, whereby a plume may be produced in an economical and expeditious manner.

EXHIBITING APPARATUS.—Bertrand Hamburg, Paul Ketterer, and Eduard Ketterer, Frankfort-on-the-Main, Germany. It is an automatic device for displaying watches, jewelry, and other articles, causing them automatically to pass before the eyes of spectators intermittently, to allow of their convenient inspection.

PUZZLE.—Samuel P. Chandler, Ashton, S. C. It consists of two notched bars interlocked with three series of notched blocks, one series of which is arranged between the notched bars and the other two series of which are arranged on opposite sides of the notched bars at right angles to and interlocking with the first series of blocks.

MOTOR.—Cornelius C. Epp, Bradshaw, Neb. This invention covers the use of a drive weight in combination with a train of gears, the device embodying certain novel features of construction and combinations of parts, and being intended especially for operating pumps.

GROCER'S BIN.—Lysander Johnston, Tyler, Texas. This invention consists in a box or bin pivoted so that its upper open end may be conveniently tilted out for the purpose of replenishing or taking therefrom, and as conveniently pushed back into the casing, which has stops for limiting the opening and closing movements of the box.

BANJO.—James J. Doyle, Albany, N. Y. The strings are all secured at one end to one adjustably supported holder and at their opposite ends to independent individual keys, so that they may be independently tuned for playing, and thereafter all lowered and again raised simultaneously.


## SCIENTIFIC AMERICAN BUILDING EDITION.

**DECEMBER NUMBER.—(No. 38.)**

TABLE OF CONTENTS.

1. Elegant plate in colors, showing three designs for small cottage dwellings, for twenty-five foot lots. Cost, fifteen hundred dollars each. Floor plans, details, etc.
2. Plate in colors, illustrating a village school house, to cost three thousand dollars. Details, floor plans, etc.
3. Full page illustration of the great chimney at the Clark Thread Works, Kearney, N. J. Height, 335 feet. The tallest chimney in America.
4. Perspective view and floor plans of an attractive residence built at East Orange, N. J. Cost, eight thousand five hundred dollars.
5. A cottage recently erected on Sound View Hill, New Rochelle, N. Y. Plans and perspective. Cost, four thousand dollars.
6. Views of the Pratt Institute for Industrial Education, Brooklyn, N. Y.
7. A cottage for four thousand three hundred dollars, recently erected at Rochelle Park, N. Y. Plans and perspective.
8. Perspective and floor plans of an attractive cottage built recently at East Orange, N. J. Cost, six thousand dollars.
9. A suburban villa built lately at Richmond Hill, Long Island. Cost, seven thousand dollars. Plans and perspective.
10. Engraving of a country residence at East Orange, N. J., with plans and perspective. An excellent design.
11. A residence on Renolds Terrace, in Orange, N. J., lately built at a cost of eight thousand dollars. Perspective view and floor plans.
12. Design for the new court house and post office, Abingdon, Va.
13. Design for the new building for the United States post office, etc., at Dayton, Ohio.
14. An admirable design for a suburban residence of the Queen Anne type, recently built at East Orange, N. J. Cost, nine thousand dollars. Perspective and floor plans.
15. Perspective and plans of a barn and carriage house built at Richmond Hill, Long Island. Cost, eight hundred dollars.
16. The Villa Reiss, near Cronberg, Taunus Mountains, Germany. New residence of the Empress of Germany.
17. Miscellaneous contents: Publication of designs.—The Drexel building, Philadelphia.—Ancient sanitation.—Effect of adding sugar to cement.—The New York safety dumb waiter, illustrated.—The automatic regulation of the temperature in houses, illustrated.—The Aldine fireplace, illustrated.—The Howard combination heater, illustrated.

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## Business and Personal.

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## NEW BOOKS AND PUBLICATIONS.

MANUAL OF CHEMISTRY. W. Simon. Philadelphia: Lea Brothers & Co. Pp. 479. Price $3.

The author is a professor of chemistry in the Maryland College of Pharmacy, Baltimore, and has here presented a guide to lectures and laboratory work for beginners, a text book specially adapted for students of pharmacy and medicine. This is the second edition of the work, which has been revised and greatly enlarged, now having forty-four illustrations and seven colored plates, the latter representing fifty-six chemical reactions.

HYGIENE OF THE NURSERY. By Louis Starr. Philadelphia: P. Blakiston, Son & Co. Pp. 212. Price $1.50.

The endeavor has been in this book to point out a series of hygienic rules which, if applied to the nursling, can hardly fail to maintain good health, give vigor to the frame, and lessen susceptibility to disease, little or no reference being made to drugs or methods of medical treatment. The author is a physician to the Children's Hospital, Philadelphia.

EATING FOR STRENGTH. By M. L. Holbrook. New York: M. L. Holbrook & Co. Pp. 236. Price $1.

This is a dissertation on food and diet in relation to health and work, giving several hundred recipes for wholesome food and drinks, presenting much of the most recently attested data in a way to make them valuable for actual use in daily life.

POOR'S DIRECTORY OF RAILWAY OFFICIALS. Third annual number. New York: H. V. & H. W. Poor. Pp. 400. Price $2.

This book is a supplement to Poor's Railroad Manual, containing lists of officers of all railroads in the United States, Canada, Mexico, and Central and South America; also of officers of auxiliary enterprises, as express, sleeping car, and equipment companies, of manufacturers of various kinds connected with railroad business, etc. The directory contains 30,000 names.

CURIOSITIES OF THE UNITED STATES PATENT OFFICE. By William Chandler Raymond. Syracuse, N. Y.: William C. Raymond. Pp 168.

This book is perhaps more amusing and entertaining than instructive, for its principal features are those noting some of the curious, comical, and remarkable patents granted to inventors in past years, for the collating of which the author, who was formerly an attache of the Patent Office, seems to have had a penchant,

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# Notes & Queries

## HINTS TO CORRESPONDENTS.

**Names and Address** must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

**References** to former articles or answers should give date of paper and page or number of question.

**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

**Special Written Information** on matters of personal rather than general interest cannot be expected without remuneration.

**Scientific American Supplements** referred to may be had at the office. Price 10 cents each.

**Books** referred to promptly supplied on receipt of price.

**Minerals** sent for examination should be distinctly marked or labeled.

(1) G. W. asks a recipe for hardening soles of shoes. A. There is nothing practical for such purpose, except using nails or some such covering, as adopted in miners' shoes. Leather does not lend itself to any hardening process not already in use in its making.

(2) C. T. asks: 1. What is the strength of the solution of pure arsenic to be used for spraying fruit trees? A. If white arsenic is used, it is apt to injure the leaves. Mr. Gillette, of the Iowa Agricultural College, found that 1 pound arsenic to 400 gallons of water injured apple tree leaves, and 1 pound to 800 gallons injured plum tree and poplar tree leaves. Even 1 pound to 1,200 gallons affected plum trees. This is therefore the maximum strength, and is probably too weak to be of much efficacy as an insecticide. Recent experiments by Professor A. J. Cook, of the Agricultural College of Michigan, show that three applications of "London purple," 1 pound to 100 gallons of water, can be applied to apple trees. The foliage is injured, but the fruit ripens. We also refer you to SCIENTIFIC AMERICAN SUPPLEMENT, No. 475, for a valuable paper on the subject of destruction of insects on trees. 2. How can the disjoined column of mercury be reunited in a combined maximum and minimum thermometer? A. The column can be joined by jarring the instrument with the main bend downward. The method of filling is practically a trade secret.

(3) J. G. asks for the process of gilding letters (sunk) on marble. A. It is executed like other gilding; the letters are sized and the leaf is put on with a camel's hair pencil; the flat surface of the marble around the letters is rubbed off with cuttlefish bone.

(4) J. H. asks: What will keep plate glass windows from perspiring after lighting gas in show windows? I have tried almost everything without success. The windows are closed in the back with sliding doors, and have a 4 inch ventilating hole in the ceiling. A. Probably you have not a sufficient space at the bottom to provide for an air supply. A through draught is needed. Top ventilation alone is not sufficient.

(5) P. H. L. asks: 1. Why is the armature core of a dynamo made up of a series of iron washers insulated from each other by paper washers? A. To prevent currents of short circuits, which would otherwise be generated in the armature core. They are known as Foucault currents. 2. Could not a solid iron core be used instead? A. Yes, but it would be wasteful, as energy would be absorbed in the production of Foucault currents. 3. Is there any magnetism about a dynamo when not in motion? If not, what causes the magnetism in the field magnet, which the armature picks up and sends out through the wires? A. Yes; it is known as residual magnetism, and is the starting point for the action of the machine. 4. What is the best low priced book on construction of dynamos? A. Hening's Principles of Dynamo Construction. We can send it free by mail for $2.50.

(6) Bookman asks: How can I remove ink stains from paper? I have a lot of second hand books and I want to remove the names from the front pages without defacing them. A. You will have much difficulty in doing it. Use oxalic acid dissolved in water, followed by javelle water. Hydrochloric acid dilute may be used to remove the iron stain left by old ink. We also refer you to SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 55, 158, and 471.

(7) P. S. asks: How much coal gas is made from 1 ton (2,240 pounds) of coal? A. 9,000 to 12,000 cubic feet.

(8) G. A. M. asks how to tell a genuine gold leaf gilt frame from one that is not. A. By scratching the surface. If the frame is silver-coated and varnished, the silver will show when the lacquer is scraped off. If of gold leaf, the body of the frame will appear. To one familiar with both kinds, the gilded frame can be recognized by its appearance.

(9) C. C. M. asks for receipt for making Saratoga chips (potatoes). A. Either lard or cottonseed oil can be used; the former is generally preferred. The potatoes are cut raw into very thin slices or spiral shavings. It is then a good practice to soak them for 10 or 12 hours in cold water. The lard or oil is placed in a deep pan and is brought to a good heat and the potatoes after draining are thrown in. The heat should be sufficient to make them "sizzle." When brown they should be removed with a perforated skimmer, and shaken in a cullender with a little salt. Experience is everything; the art is in knowing when to withdraw them.

(10) W. A. M. writes: I have constructed a static machine capable of giving a 4½ inch spark. Can it be made to work the simple electric pen as described in back number of SCIENTIFIC AMERICAN, and how? I have tried several methods without success, as sparks pass through paper without perforating it. Placing the paper between electrodes separated an inch or so, it is perforated nicely by the spark. A. The paper is undoubtedly perforated, but the rubbing of the pen may tend to close the minute holes. Try the effect of placing a piece of thick blotting paper under the paper on which you write. Possibly the underlying carbon plate is too smooth.

(11) A. D. W. writes: Lines drawn in the center of a 10 gauge double-barreled shot gun will meet at the distance of about 8 feet from the muzzle, and if continued to the ordinary distance of shooting, will be about 2 feet apart, *i. e.*, the center of the pattern made by the left hand barrel would be about 2 feet to the right of center of pattern made from right hand barrel. As the facts do not substantiate the theory, will you please explain why? A. The barrels of a double-barreled gun are inclined toward each other because the sighting is done along the central rib. Possibly the gun you refer to is over-corrected. The recoil also not being axial tends to throw the gun to one side, varying with right and left hand barrel.

(12) G. H. A. asks (1) how to cut a glass jar in two. A. File a slight notch on side, hold a red hot poker against notch, and move poker back and forth until a crack is started, which you can lead in any direction by moving poker, which must be heated anew from time to time. 2. Will electricity affect a person's watch when they are taking shocks from an electro-magnetic battery, and will it affect them as soon as the current is turned off? A. It will not in the sense you refer to. 3. How is the simplest as well as the cheapest battery made? A. For batteries we refer you to our SUPPLEMENT, Nos. 157, 158, and 159.

(13) J. C. L. asks (1) if a dynamo-electric machine armature 4½ inches diameter, 3 or 3½ wide, having three or four layers wound around its core, can be driven at 2,000 revolutions per minute. A. Yes. 2. Can you give me a formula or rule for determining it? A. No rule can be given; the speed named is within the limits determined by practice. 3. Is Russia sheet iron suitable for making the laminæ of an armature core? A. It is about the best material.

(14) P. D. H. asks for a good battery to work eight electric bells. A. Use four cells of the new Sampson carbon battery, in which a cup of carbon holds the black oxide of manganese instead of the usual clay cap. Employ a reliable electrician to test your wires for crosses and leaks. Brighten up the door connection by removing the dust from the surface of metal.

## Enquiries to be Answered.

The following enquiries have been sent in by some of our subscribers, and doubtless others of our readers will take pleasure in answering them. The *number* of the enquiry should head the reply.

(15) At what speed can a housefly fly? —J. A. A.

(16) How can I prepare a good grafting wax?—R. W.

(17) Which bird flies the fastest, carrier pigeon, duck, or bullet-head hawk? Also, what is the fastest bird and its record?—J. G.

(18) How can I make a good violin varnish? A tender and at the same time wearable varnish. The color to be a blood red. Also, how can I find the tone a piece of wood gives?—C. C. M.

(19) Will you please inform me through your valuable paper if there is any mechanical device known that will propel itself until it breaks or wears out?

(20) Will you please tell me how maps in relief are made, such as are used in Germany and other countries in the schools? I understand modeling in clay and casting in plaster, but wish to make them of something that will not break so easily.—"Halifax."

(21) 1. How are leather cuttings dissolved and prepared for further use? 2. What cement medium is used? 3. How are buckets, bathtubs, etc., of wood pulp made? 4. What is the substances besides wood pulp? 5. What cement medium is used? 6. How prepared to stand the moisture? 7. If pressed, what pressure is necessary? 8. How dried? I hope that you kindly will oblige one of your subscribers here in Norway by giving full information about above. It will no doubt interest many readers of your paper.—E. C. G.

(22) When is the best time and what is the best method of grafting pear trees?—F. F. B.

(23) Please let me know how to prevent limed eggs from cracking while boiling. And how to make old cider, two and three years old, quick to vinegar. The cider is placed in the yard about three months. About two weeks ago I added to each barrel two quarts of Porto Rico molasses. It has not changed yet.—H. J. B.

(24) What coating is used to preserve old maps made on paper with cloth backing (the usual mounted paper of draughtsmen)? The one I have begins to flake or peel off, showing that the paper is brittle.—D. H. Van A.

(25) What is the best way to get yellow stains out of ivory? And the best way to get stains out of marble?—H. L.

(26) How can cottonseed oil be bleached and refined to substitute the lard? And which are the proportions to use it as lard?—J. L.

(27) 1. If a Bell telephone receiver be required to work on a very short line as both transmitter and receiver, should the winding or the adjustment of the diaphragm be altered in any way? 2. How much wire, and of what size, shall I use in making a receiver to work on a circuit with a microphone transmitter? 3. Whether will a single or a multiple contact transmitter give the best results? 4. Where can I get instructions for making a magneto bell? 5. I want to make a cover for a carbon battery by melting some lead and casting it in the form of a plate in which one end of each carbon is to be embedded. Will the heat be apt to break the carbons (arc light carbons), and if so what would be a good substitute for lead? 6. Which would be better for house bell and gas lighting—a carbon battery or a cell made of cast iron, zinc, and a solution of caustic potash, the cells being of the same size? —T.D. McC.

(28) Please tell me how to make a liquid ink eraser for both red and black ink.—J. K. McB.

(29) I have a C. and C. motor which has been changed to a dynamo. It is ⅛ H. P., 13 volts, 9½ amperes. If I could, I would like to run it by a turbine wheel from a ⅝ inch pipe. I can get a pressure of 25 pounds. If you think that would run the motor at a speed between two and three thousand revolutions a minute, please tell me where I could get a formula for making such a wheel. If I could not run it that way, how many and what kind of cells would it take to run it as a motor?—C. F. D.

(30) Please tell me how to temper steel cutlery, such as daggers, Bowie knives, butcher knives, etc.—R. W. H.

(31) Please give directions for making an oxygen bag to use in connection with an oxy-calcium light for magic lantern. How can an amateur silver a copper or brass reflector?—H. P.

(32) Would paper placed between the tin and sheeting of a tin-roofed building prevent moisture from accumulating and dropping in the room where there is no ceiling in cold, frosty weather?—J. A. B.

(33) I wish to ascertain the best and easiest method of removing old lacquer from brass instruments. Also a receipt for making aluminum lacquer, and other qualities, such as mathematical instrument makers apply to their brass instruments to take off the bright glaze. Also how to apply, if brass should be warm or cold. Give method or receipt to make various colors of lacquer.—"Rocky Mountains."

(34) 1. Is there any rule by which the size of wire for a given current may be found (say current to be 110 volts and 120 ampere strength)? Please give me the rule for finding size of wire for different currents if you can. 2. Why is it that the wire on the armature of a dynamo is smaller than the wire used for a line wire? I cannot understand how it can be kept from heating, when I take into consideration that it has to carry the full current of the dynamo. 3. What rule is followed in winding armatures for dynamos by which a current is to be produced, the E.M.F. of which is to be 110 volts? 4. Can dynamos be built so as to give currents of different amperes, and still have the same E.M.F. or voltage?—W. F. H.

(35) I have a Talbott "Dixie" portable engine and boiler, engine 5 x 8 cylinder. I want to run a small circular saw with it, but am afraid I have not much power to spare. Suppose I attach a sawmill mandrel direct to engine shaft, would I have any more power than by using a belt? About how large an engine using a belt would mine equal in power, and about how much could I saw in ten hours of yellow pine, using a 36-inch saw? The boiler is the "Dixie" pattern, with large, straight shell, with the firebox inside the shell. I want to change it to a tubular by taking out the front head, firebox, and tubes, and putting on a flush front and new tubes. Boiler is 33 inches diameter, 5 feet long. Would it furnish steam enough to run the engine? About how much power would the boiler have?—X. L.

(36) I am a regular reader of your valuable paper, and would like to have you answer a question in your next issue if possible. How are steel spectacle and eyeglass frames bronzed and blued? How must I go to work about it? How is it done by our larger factories, that the entire frame has the same shade, and that it will not wear off easily?—"St. Louis."

(37) Oblige a subscriber by stating where the facts can be found touching the manufacture of leather without the use of bark. Some time ago I noticed in your paper an account of a plant in Germany where the industry was carried on. Do you think that there is any practical method by which an industry of this kind could be made to pay in this country? There are an immense number of hides shipped away to the Eastern manufacturers from this country, to come back as boots, shoes, harness, etc. The country is filling up, and it seems as if the manufacturing of articles for home consumption ought to be done nearer home, especially as the time is fast approaching when the population will be numerous enough to warrant it.—E. A.

(38) I have some jars which were used for electric bells. They are about 4 inches in diameter by 6 inches high. Can I use these for an incandescent lamp? And about how many of these jars will do for one lamp? And how should I make the battery? Please reply in next week's SCIENTIFIC AMERICAN.—T. D.

(39) Is there any method I can use in making press copies of writing to make the copies clear and distinct? I copy from ten to fifteen sheets at once, making a double copy of each, and am often troubled by copies being illegible. By answering the above through the columns of your paper you will greatly oblige.—J. F. A.

(40) Would you please let me know how a luminous paint could be made that would show distinctly under water?—Rubicon.

(41) 1. Can you give the formula of a mixture that will cause stumps to be consumed by fire? 2. Please give formula of mixture that will improve the color of maple sirup. 3. Give best process of filtering maple sap, before boiling, to take out filth.—L. D. A., Jr.

(42) Can you tell me of any colored powder liquid or chemical that will change liquid gas tar from black to red, or brown? Please inform me if you can.—A. F. L.

(43) When shooting from a rifle, why does the bullet always strike in a line with the top of the sights, instead of eleven-sixteenths of an inch below, as that is about the distance from the top of the front sight to the center of the barrel?—G. C. N.

**TO INVENTORS.**

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

# INDEX OF INVENTIONS

**For which Letters Patent of the United States were Granted**

**December 4, 1888,**

**AND EACH BEARING THAT DATE.**

[See note at end of list about copies of these patents.]

Adjustable screen, A. Vivarttas ..... 393,944
Air brake, H. S. Park ..... 393,784
Air brake, G. B. Williams ..... 393,950
Air purifying, cooling, and ventilating device for railway cars or buildings, D. G. Proctor ..... 393,924
Alarm. See Boiler alarm.
Album clasp, F. Deck ..... 393,889
Alloys, making aluminum, W. A. Baldwin ..... 394,091
Animal traps, jaw spring for, S. W. Baldwin ..... 393,809
Annunciator target, electric, Patten & Bingham .. 394,081
Arch and brick for building the same, flat, J. C. Anderson ..... 394,048
Armature for dynamo-electric machines, L. Daft. 393,745
Awning, H. B. Knoblanch ..... 394,120
Axle lubricator, car, W. H. & F. C. Burden ..... 394,096
Ballot box, registering and canceling, R. G. Wood 393,953
Bar. See Grate bar. Type bar.
Barge, dumping, G. N. Kenyon ..... 394,073
Barrel, bucket, or tub, T. H. Jacobs ..... 393,833
Batteries, indicator for secondary, S. C. C. Currie, 393,744, 394,100
Battery. See Galvanic battery.
Battery plates, making secondary, W. W. Griscom ..... 393,755
Bedsteads, attachment for folding, F. B. Williams ..... 393,803
Bell, door, J. W. Clark ..... 393,818
Bell, electric, J. F. McLaughlin ..... 393,998
Bell ringer, automatic, T. D. Heffernan ..... 393,830
Belt, driving, G. W. Heffner ..... 393,902
Belt fastener, T. Lynett ..... 394,076
Belt stretching machine, B. M. Plummer ..... 394,008
Bicycle, S. Forman ..... 394,067
Bicycle, H. F. Henry ..... 393,904
Bicycle, G. Kibbe ..... 393,837
Billiard table, J. Kostner ..... 393,910
Blasting, G. Trench ..... 393,798
Block. See Pillow block.
Blowing engine, E. Reynolds ..... 393,856
Boat. See Tow boat.
Boiler. See Locomotive boiler. Steam boiler.
Boiler alarm, steam, S. Lloyd ..... 393,911
Boilers, hydrocarbon furnace for steam, F. W. Ofeldt ..... 393,850
Bolt for connecting rails for permanent ways, G. Coulon ..... 394,098
Bolting reel, W. D. Gray ..... 393,825, 393,826
Boot or shoe, W. D. McCoy ..... 393,776
Boot or shoe heels, apparatus for making, A. Farina ..... 393,892
Bouquet holder, S. B. Coston ..... 393,886
Box. See Ballot box. Core box. Cracker box. Letter box. Sign box.
Brake. See Air brake. Cornice brake. Lock brake. Sled brake.
Brake mechanism, fluid pressure automatic, G. B. Williams ..... 393,872
Bread, S. Preston ..... 393,923
Brooms, etc., holder for, Engelman & Kiser ..... 394,064
Buckle, C. H. Anderson ..... 393,736
Buckle, M. Rubin ..... 394,014
Buckle, belt, M. Rubin ..... 394,013
Buckles, fastening attachment for, G. W. Hayman ..... 394,072
Buggy boot, G. Monteith ..... 393,780
Burner. See Gas burner.
Butter mould, H. B. Souders ..... 394,028
Button, C. Prentice ..... 394,132
Button fastener, Clark & Ingraham ..... 393,740
Buttonhole stitching and barring machine, J. H. Reed ..... 394,134
Can opener, G. W. Lyons ..... 394,123
Car coupling, J. Wright ..... 394,147
Car for bicycle railways, freight, E. M. Boynton .. 393,961
Car for elevated roads, railway, E. M. Boynton ... 394,092
Car motor, street, W. S. Salisbury ..... 394,015
Car starter, G. B. Haines ..... 393,827
Cars, heating and lighting, Saunders & Patton .... 394,018
Cars, propelling gear for tram, G. D. Gilbert ..... 393,896
Cars, receptacle for clothes in sleeping, P. A. Gordon ..... 393,975
Cars, steam heating apparatus for railway, L. D. Jobes ..... 393,908
Cars, whiffletree attachment for horse, L. Pfingst 393,922
Carbolic smoke ball holder, A. J. Spinner ..... 394,029
Carpet stretcher, J. Kingsland, Jr ..... 393,909
Carriage, C. Thomas ..... 393,937
Cart, road, J. M. Fugett ..... 393,971
Case. See Pencil case.
Cash mat, E. Sears ..... 394,083
Catamenial sack, P. M. Boleman ..... 393,882
Celluloid and similar compounds, apparatus for the manufacture of, J. R. France ..... 393,732
Chain, drive, S. D. Locke ..... 393,992
Chains, die for making drive, S. D. Locke ..... 393,913
Chains, making drive, S. D. Locke ..... 393,912
Chair bottom, J. Harley ..... 393,758
Change maker, W. H. Toft ..... 393,939
Chisel for cutting hinge recesses, gauge, A. T. Binkerd ..... 393,880
Chisel gauge, A. T. Binkerd ..... 393,881
Clamp. See Rope clamp.
Clasp. See Album clasp.
Clasp, E. Johnson ..... 393,983
Cleaner. See Flue cleaner.
Cockle separator, F. W. Howell ..... 393,829
Coffee, apparatus for leaching, F. C. Wilson ..... 394,046
Coffee, composition for coating, F. W. Moore ..... 393,917
Coke, apparatus for cooling, D. R. Murphy ..... 394,127
Collars, machine for stuffing horse, S. H. Ewing .. 393,822
Commutator, C. L. Buckingham ..... 394,095

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Contact, duplex upward pressure, C. J. Van Depoele..... 394,038
Contact for overhead conductors, constant upward pressure, C. J. Van Depoele..... 394,037
Conveyers, reversible driving gear for, Jarrett & Bower..... 393,762
Core box, M. Fitzgerald..... 394,108
Cornice brake, H. Symonds..... 394,145
Corset, E. Pohl..... 393,786
Cotton chopping machine, A. G. Deshazo..... 393,821
Cotton press, R. S. Munger..... 394,125
Coupling. See Car coupling.
Cracker box, S. E. Parrish..... 393,852
Crib or child's bed, D. J. Powers..... 394,010
Cuff fastener, T. Prestwich..... 394,133
Cultivator knife, Hoskins & Ray..... 393,761
Cutter. See Paper cutter.
Desk and blackboard, combined, S. J. Talbott..... 393,934
Desks, cabinet attachment for, J. Thompson..... 393,938
Display stand, F. M. Wilson..... 393,873
Distilling turpentine, J. B. Underwood..... 393,942
Draught attachment for harness, J. Bloedel..... 394,051
Dress form, Tuck & Smith..... 393,793
Dress protector, L. Heumann..... 393,979
Drill. See Mining drill.
Dyeing or scouring machine, J. H. Lorimer..... 393,769
Earth, sand, etc., apparatus for moving, A. McDougall..... 393,996
Electric cable, submarine and subterranean, Flotrom & De la Bastie..... 393,823
Electric conductors, apparatus for removing scale from, L. Daft..... 394,062
Electric conductors, system of suspending, C. J. Van Depoele..... 394,039
Electric lighting, system of, W. W. Griscom..... 393,756
Electric machinery, dynamo, W. F. Collins..... 393,742
Electric machinery, dynamo, S. E. Nutting..... 393,849
Electric motor, C. J. Van Depoele..... 394,035
Electric motor and dynamo electric machine, O. Lugo..... 394,075
Electrode for secondary batteries, H. Woodward. 393,955
Electrodes for secondary batteries, producing, H. Woodward..... 393,954
Electromotor, duplex, C. J. Van Depoele..... 394,036
Elevator. See Electrical water elevator. Water elevator.
Elevator, A. S. Humphrey..... 393,831
Elevators, controller for, W. S. Johnson..... 393,834
Engine. See Blowing engine. Pumping engine. Steam engine.
Etching on glass, metals, etc., appliance for, C. Tompsett..... 393,867
Exhauster, E. & G. H. Ritzenfeld..... 393,857
Exhibiting apparatus, automatic, B. Hamburg *et al*..... 393,898
Extension table, G. Q. Dolliver..... 393,890
Extracts, making, M. Gross..... 393,976
Eyeglasses, H. E. Kirstein..... 393,986, 393,987
Farm gate, P. Dyer..... 393,891
Farm gate, A. J. Hoskins..... 394,117
Feather product, Wilson & Hawkins..... 393,951
Feed water heater, P. Rohan..... 394,136, 394,137
Fencing, machine for making wire and picket, J. F. Russell..... 394,082
Fertilizer distributer, J. M. Howell, Jr..... 393,907
Fiber dusting machine, F. G. Sargent..... 394,017
Filter attachment for cistern pumps, J. A. Cypert..... 393,820
Fire back, S. Bernstein..... 393,959
Fire escape, C. M. Fowler..... 394,109
Fireplace, W. O. Wheeler..... 394,042
Fishing rod handle, C. S. Treadway..... 394,032
Flue cleaner, boiler, I. Barker..... 393,810
Frogless switch, C. W. Jones..... 394,118
Furnaces, air feeding device for, G. R. Uridge..... 393,800
Furnaces, stationary grate for, W. McClave..... 393,843
Gauge. See Chisel gauge.
Galvanic battery, P. C. Burns..... 393,814
Game, card, A. M. Fitch..... 393,969
Garment stand, O. Borchert..... 393,960
Gas burner, E. B. Cutten..... 394,101
Gas, mixing and injecting apparatus for making, M. Gross..... 393,977
Gate. See Farm gate.
Gate, A. J Hinkle..... 393,906
Generator. See Steam generator.
Glass, machinery for grinding, shaping, and polishing, Besson & Kent..... 393,811
Gold separating apparatus, J. S. George..... 394,112
Grain binding machine, H. J. Case..... 393,815
Grain scouring machine, C. C. Schill..... 394,019
Grain separator, G. W. Morris..... 394,061
Grate, G. B. Mershon..... 393,999
Grate bar, C. J. M. Hayna..... 394,114, 394,115
Grate, stove, range, and furnace, W. McClave..... 393,844
Guard. See Window guard.
Guns, lock mechanism for, P. Mauser..... 393,842
Handle. See Fishing rod handle.
Handles, die for moulding composition, A. C. Estabrook..... 394,107
Harness rosette, C. H. Foster..... 393,892
Harrow and seeder, combined disk, F. H. Norton. 394,128
Harrow, oscillating sulky, Weeks & Sellers..... 393,801
Harvester reel, M. A. Clapp..... 394,058
Harvesting machines, divider for, S. W. McAlister..... 393,774
Hat label holder, E. Promis..... 393,854
Hat sizing machine, J. S. Taylor..... 393,866
Hay sling, J. Toney..... 393,940
Head rest, portable, C. O. Widmayer..... 394,044
Header and thrasher, combined, J. Minges..... 393,847
Heater. See Feed water heater. Steam and warm air heater. Water heater.
Holdback, vehicle, C. W. Teetzel..... 393,797
Holder. See Bouquet holder. Carbolic smoke ball holder. Hat label holder. Lead or crayon holder. Mop and brush holder. Paper holder. Shaft holder.
Honeycomb foundations, device for fastening, J. W. Bittenbender..... 393,739
Horse boot, O. Glismann..... 393,974
Horse power, C. E. Sutton..... 393,794
Horseshoe, Jutson & Poupard..... 393,837
Hotel indicator, R. R. Gareau..... 393,894
Ice cutting machine, Baker & Fritch..... 393,807
Incubators, heat regulator for, J. F. Carr..... 394,057
Indicator. See Hotel indicator. Mail indicator. Street and station indicator.
Inhaler, C. E. Warren..... 393,869
Injector, H. B. Murdock (r)..... 10,971
Insect trap, J. D. McMeen..... 393,778
Iron. See Waffle iron.
Jack. See Lifting jack.
Jewelry, fastening for, J. Long..... 393,993
Kitchen cabinet, M. H. Shanley..... 393,861
Knife. See Cultivator knife.
Lacing studs, machine for setting, Bray & Pope.. 393,813
Lamp chimney, J. Raddin..... 393,855
Lantern, F. R. & A. P. Smith..... 394,025
Lasting machine, Hathaway & Paull..... 393,760
Lasting machine, W. Lawes..... 393,768
Lasting machine, Luscomb & Corey..... 393,772
Latch, V. Spicer..... 394,140
Lead or crayon holder, C. W. Boman, 393,812, 394,053, 394,054
Lead or crayon holder, E. Tyrrell..... 394,146
Leather rounding machine, Roberts & Lipps..... 393,783
Leather working machine, G. P. McMahon..... 393,845
Letter box, Cummings & Church..... 394,099
Leveling instrument, A. T. Binkerd..... 393,879
Library check system, A. V. Abercrombie..... 393,806
Lifting jack, J. M. Smith..... 393,930
Light extinguisher, C. Stowe..... 393,933
Lighting by secondary batteries, train, W. W. Griscom..... 393,757
Lock. See Nut lock. Permuation lock. Safe or vault door lock. Seal lock.
Lock brake for vehicles, W. R. Wilcox..... 393,949
Locomotive boiler, C. S. Smith..... 393,790
Loom shuttle, H. Bardsley..... 393,958
Looms, cutting attachment for double pile fabric, W. Wattie..... 393,947
Looms, weft stop motion for, Taylor & Saalfrank. 393,935
Lubricator. See Axle lubricator.
Mail indicator, post office, W. Weber..... 393,870
Mallet, N. B. Runnals..... 393,789
Mash tub, G. A. Ohl..... 393,851
Mat. See Cash mat.
Metal bars, machine for upsetting, W. Ross..... 394,011
Metal mould, T. W. Vare..... 394,089
Middlings purifier, A. Hunter..... 393,981
Mill. See Rolling mill. Sawmill.
Mining drill, ratchet, W. A. Gentry..... 393,895
Miter cutting machine, W. R. Fox..... 393,970
Mould. See Butter mould. Metal mould.
Moulding apparatus, W. S. Withers..... 393,804
Mop and brush holder, convertible, C. L. Fortin.. 394,069
Mortising machine, W. H. Clapp..... 393,817
Motor. See Car motor. Electric motor. Spring motor. Water motor. Weight motor.
Motor, H. Silvester..... 393,862
Mowing machine, G. W. Maxwell..... 393,914
Musical instrument, pneumatic wind, W. D. Parker..... 394,006
Musical instruments, pneumatic action for, W. D. Parker..... 394,005
Nail machines, manufacture of knives for, L. B. Rockwell..... 393,858
Nut lock, J. D. Cleek..... 394,097
Nut lock, W. S. Starnes..... 394,143
Nuts, die for making, J. H. & P. H. Sternbergh.... 393,792
Oil distributer for harbors, etc., J. N. Lyle..... 393,995
Oil from oleaginous seeds, apparatus for extracting, E. T. Gennert..... 393,973
Oil from oleaginous seeds, extracting, E. T. Gennert..... 393,972
Organ stop action, F. Weinbrenner..... 393,871
Organs, mouse and dustproof attachment for, A. & H. B. Marcy..... 393,773
Oxygen, apparatus for generating and storing, I. R. B. Arnold..... 393,737
Packing rings, machine for dividing, O. J. Garlock..... 394,111
Packing vessel, knockdown, J. H. J. Haines..... 393,899
Pad fastening, W. H. Osmer..... 393,783
Padlock, permutation, E. Kauffeld..... 394,119
Pail, commode, G. W. Lisk..... 393,991
Pail, milk, M. A. Van Alstine..... 394,084
Paint vehicle, W. A. Johnson..... 393,763
Paper box covering machines, cutting-off device for, C. E. Clute..... 393,964
Paper cutter, L. Ehrlich..... 394,063
Paper cutter, roll, J. A. Eastin..... 394,104
Paper cutter, roll, E. L. Knopp..... 394,121
Paper fastening setting tool, T. C. McCollom..... 393,915
Paper holder and cutter, roll, J. Zerr..... 393,956
Paper in the web, apparatus for filigraining, S. J. Timohowitsch..... 394,030
Paper pulp, apparatus for drying, J. H. Lorimer.. 393,770
Paper stock, apparatus for making, J. D. Tompkins..... 394,031
Paving compound, vulcanite, W. C. Murdock..... 394,126
Pencil case, T. B. De Forest..... 393,965
Pencil leads, automatic holder for, G. R. Sandell.. 394,016
Pencil sharpener, L. P. Normandin..... 394,002
Permutation lock, J. A. Porter..... 394,009
Phonograph recorder, T. A. Edison..... 393,968, 394,105
Phonograph reproducer, T. A. Edison..... 394,106
Pickets, shingles, or similar articles, machine for pointing, N. A. Acuff..... 393,875
Pictures, device for hanging, J. B. Sword..... 394,144
Pillow block, D. A. Cameron..... 394,056
Pivot, transom, E. H. Duchemin..... 394,103
Planing machine, wood, J. F. Welch..... 393,948
Planter, potato, Senour & McHenry..... 393,860
Plow, T. Hayden..... 394,071
Plug, fusible, J. E. Davis..... 394,102
Plume, R. W. E. Aldrich..... 393,877
Pocket, device for preventing purses from being stolen from the, E. C. Whitlock..... 394,043
Pole, vehicle, B. F. Rix..... 393,787
Potato separator, J. H. Nowvioch..... 393,848
Power. See Horse power.
Press. See Cotton press.
Printing machines, sheet delivery apparatus for, J. T. Hawkins..... 393,978
Protector. See Dress protector.
Pulley, J. Toney..... 393,941
Pulley, split, E. C. Tecktonius..... 393,936
Pulverizing machine, J. W. Hilton..... 393,905
Pump, A. J. Tyler..... 394,088
Pump attachment, A. J. Tyler..... 394,087
Pump, double-acting force, A. J. Tyler..... 394,086
Pump, force, S. F. Farrow..... 394,065
Pumping engine, steam, J. H. Vaile..... 393,943
Puzzle, S. P. Chandler..... 393,816
Pyrometer, E. Brown..... 393,962, 393,963
Pyroxyline compounds, manufacturing collars, cuffs, etc., from, J. R. France..... 393,750
Pyroxyline compounds, manufacture of, J. R. France..... 393,751
Pyroxyline, manufacturing articles from compounds of, J. R. France..... 393,753
Radiators, reversible hood for heat, G. E. Dixon.. 393,747
Rails, brace chair for girder, A. J. Moxham..... 394,078
Rails, rail chair for girder, A. J. Moxham..... 394,079
Railway, cable, R. P. Walsh..... 394,040
Railway, elevated, Z. H. Lowdermilk..... 393,771
Railway rail sawing machine, C. G. McLeod..... 393,916
Railway, sectional double line electric, S. H. Short..... 394,139
Railway switch, J. A. Kirby..... 393,765
Railway switch, portable, F. G. Johnson..... 393,985
Railway system, E. M. Boynton..... 394,055
Reamer, L. Lassen..... 393,767
Reamer and constructing the same, J. E. McConnell..... 393,775
Reel. See Bolting reel. Harvester reel.
Revolver, J. T. Smith..... 394,027
Rocket, P. Licht, Jr..... 393,990
Roller. See Street roller.
Roller and grain drill, combined, O. C. Kroh..... 393,839
Rolling mill, C. F. Lloyd..... 394,122
Rolling mill, F. H. Wright..... 393,805
Rolling side flanged center bearing rails, mill for, E. Simpson..... 394,024
Rolling side flanged grooved rails, mill for, E. Simpson..... 394,022
Rolling side flanged guard rails, mill for, E. Simpson..... 394,021
Rolling side webbed girder rails, mill for, E. Simpson..... 394,023
Rope clamp, J. W. & A. B. Wood..... 393,952
Saddle, harness, E. G. Robertson..... 393,926
Saddle, harness, E. Vogtsberger..... 393,868
Safe or vault door lock, W. M. Brown, Jr..... 393,853
Sash, window, L. Oppenheim..... 394,003
Saw filing machine, automatic, C. F. Hax..... 393,901
Saw guide, D. Fraser..... 394,110
Sawmill, band, T. S. Wilkin..... 393,802
Sawmill carriages, offset mechanism for, G. Rosenberg..... 393,927
Sawmill dog, T. S. Wilkin..... 394,045
Scale, grain weighing, H. Cutler..... 393,888
Screen. See Adjustable screen.
Seal lock, C. H. Adams..... 393,876
Seal lock, L. A. Brown..... 394,094
Seeding machines, pawl and ratchet mechanism for, E. W. Summers..... 394,085
Semaphore signal, Stitzel & Weinedel..... 393,865
Separator. See Cockle separator. Grain separator. Potato separator.
Sewing machine, Jackson & Martin..... 393,982
Sewing machine shuttle, G. W. Baker..... 393,738
Sewing machines, cutter for buttonhole, J. H. Reed..... 393,925
Sewing machines, revolving hook for, Kohler & Lachman..... 393,766
Shaft attachment for vehicles, R. Sproul, 393,791, 394,141, 394,142
Shaft holder, S. E. Hopkins..... 394,116
Shaft support, A. J. Watson..... 393,946
Shingle, paper pressed, S. E. Trott..... 394,033
Shutter bower or fastener, adjustable, W. F. Shaw..... 393,929
Sign box, illuminated, G. A. Meyer..... 393,779
Signal. See Semaphore signal.
Sled brake, M. Rouse..... 394,012
Sleigh, R. E. Lee..... 393,988
Sleigh, H. J. Simon..... 393,863
Soap cake, L. S. Samuel..... 393,928
Sole fastening wire, Clifford & Coupal..... 393,885
Sounds, recording and reproducing, T. A. Edison, 393,966, 393,967
Sower, broadcast seed, G. Stevenson..... 394,084
Spark arrester, E. M. Luckett..... 393,994
Speed governor, A. J. Pierce..... 393,853
Spike, W. Goldie..... 394,113
Spinning machines, saddle for top rolls of, G. A. Metcalf..... 394,124
Spiral spring, J. Pfeil..... 394,007
Spring. See Spiral spring. Vehicle spring.
Spring motor, A. G. Ferree..... 394,066
Stage carpets, device for moving and holding, T. J. Gay..... 394,754
Stand. See Display stand. Garment stand.
Station indicators, mechanism for operating, J. Knight..... 394,074
Station indicators, mechanism for operating, B. W. Lyon..... 394,077
Steam and warm air heater, E. V. Adkins..... 393,735
Steam boiler, J. J. Moore..... 393,781
Steam boiler and furnace, Post & Sawyer..... 394,131
Steam engine, direct-acting, F. Winn..... 394,047
Steam generator, J. W. Stevens..... 393,864
Store service apparatus, R. A. Parker..... 393,785
Stove, gas, M. J. O'Rielly..... 394,004
Stove, gasoline, A. Gateau..... 394,070
Stove or heater, coal, M. H. Stockwell..... 393,932
Stoves, burner for gas cooking, I. F. Kearns..... 393,764
Stoves or ranges, shelf for, J. F. Brayer..... 394,093
Stoves, regulating mantel, M. Schneider..... 393,859
Street and station indicator, R. W. Boisselier..... 394,052
Street roller, F. Orlikowski..... 394,129
Surgical dressings, packing antiseptic textile, E. L. Wood..... 393,874
Switch. See Frogless switch. Railway switch.
Switch stand, D. Bowen (r)..... 10,970
Table. See Billiard table. Extension table.
Table, T. Martin..... 393,841
Tally, grain, B. McDonald..... 393,777
Tamping tools, attachment for, Waldron & Boller 393,945
Telephone exchange switch fastener, W. M. Goodridge..... 393,924
Tennis net, G. E. Shepard..... 394,138
Theaters, construction of, A. Palter..... 394,130
Thermophile, H. Woodward..... 394,090
Thrashing machine and binder, combined, R. D. Norton..... 393,782
Ticket, railway, H. L. Stewart..... 393,793
Tile, culvert or drain, C. F. Mabis..... 393,840
Time recorder, workman's electric, Bassford & Maynarn..... 394,049
Tooth, spring, P. F. Wells (r)..... 10,972
Tow boat, A. McDougall..... 393,997
Transparencies, producing colored, F. W. Oliver. 393,919
Trap. See Insect trap.
Trestle, carpenter's, H. C. Smith..... 394,026
Trolley, F. E. Fisher..... 393,749
Truck, car, Pettingill & Chappell..... 393,921
Tub. See Wash tub.
Tubes, machine for making spirally jointed, T. S. Crane..... 393,743
Type bar, O. Mergenthaler..... 393,846
Upholstering chairs, F. G. Johnson..... 393,984
Valve apparatus for gas or oil motor engines, N. A. Otto..... 394,080
Valve for air compressors, E. Hill..... 393,980
Valve, steam safety, G. E. Dixon..... 393,748
Valve, tank, J. Cavanagh..... 393,884
Vehicle spring, H. C. Swan..... 393,795, 393,796
Vehicle spring, side bar, G. W. Harris..... 393,759
Vehicle, two-wheeled, C. S. Beebe..... 394,050
Vehicle, two-wheeled, J. W. Coates..... 394,060, 393,061
Vehicle, two-wheeled, A. J. Kellogg..... 393,836
Vehicle, two-wheeled, J. W. Leek..... 393,989
Vehicle, two-wheeled, R. Westphal..... 394,041
Vehicle wrench, Hemans & Thayer..... 393,903
Velocipedes, adjustable crank for, F. L. Roedel... 394,135
Voltaic plaster, W. C. Collins..... 393,741
Vulcanized plastic compound, W. Kiel..... 393,838
Waffle iron, E. Christie..... 394,058
Washing machine, E. W. Allen..... 393,957
Washing machine, S. J. Smith..... 393,931
Water elevator for buildings, electrical, A. E. Hall..... 393,928
Water heater, W. M. Barber..... 393,878
Water heater, H. E. Harrington..... 393,900
Water heating apparatus, M. H. Clifford..... 393,819
Water motor, S. B. Goff..... 393,897
Weight motor, O. M. Miller..... 394,000
Wheel, S. Forman..... 394,068
Winding machines, tension regulating device for cop, J. Couche..... 393,887
Window, W. W. Wright..... 394,148
Window guard, Sheehan & Kleemann..... 394,020
Wire coiling machine, A. Owen..... 393,920
Wire rods, device for drawing, Baldwin & Hadfield..... 393,808
Wool burring machine, W. Dearborn..... 393,746
Wrench. See Vehicle wrench.
Yoke, neck, S. R. Mott, Jr..... 393,918
Zinc, manufacturing, H. A. Huntcke..... 393,832

## DESIGNS.

Buttoner, glove, F. W. Larom..... 18,783
Cane handle, F. R. Kaldenberg..... 18,782
Chair, M. Roome..... 18,786
Cigarette case, L. W. Fairchild..... 18,779
Comb, curling and crimping, G. A. Scott..... 18,787
Flask, L. W. Fairchild..... 18,777
Flowers, foundation piece for cut, Reed & Keller.. 18,785
Knife and fork, combined, A. W. Cox..... 18,776
Match box, L. W. Fairchild..... 18,778, 18,780, 18,781
Radiator, J. F. Packer..... 18,784
Strap, E. B. Stimpson..... 18,788, 18,789
Type, L. B. Benton..... 18,775
Type, J. West..... 18,790

## TRADE MARKS.

Belting and hose, rubber, Revere Rubber Company..... 16,066
Belting and hose, second grade rubber, New York Belting and Packing Company..... 16,064
Belting and hose, third grade rubber, New York Belting and Packing Company..... 16,065
Flour, Hinkle, Greenleaf & Co..... 16,059
Flour, T. C. Jenkins..... 16,062
Gloves, kid or lamb skin leather, T. W. Stemmler.. 16,067
Inks, lithographic and printing, J. Hendricks..... 16,057
Malt liquors, S. Allsopp & Sons..... 16,053
Paper, copying and white and colored tissue, R. R. Vernon..... 16,068, 16,069
Silks, velvets, plushes, and other fabrics, J. Morgan..... 16,063
Sirup, fruit, H. M. Beecher..... 16,055
Tea, H. W. Banks & Co..... 16,054
Tea and coffee, Jones Brothers..... 16,061
Tobacco, plug or chewing, R. H. Herndon & Co.... 16,058
Tobacco, plug, twist, and fancy, P. H. Hanes & Co. 16,056
Tobacco, smoking and chewing, B. F. Weyman.... 16,070
Underwear, Jaros Hygienic Underwear Company.. 16,060

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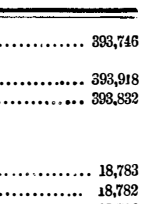

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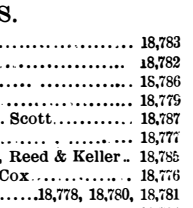

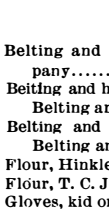

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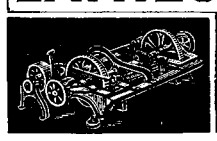

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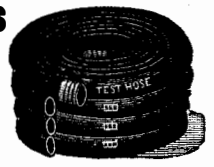


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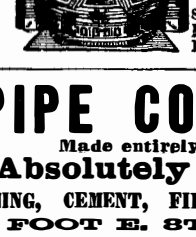

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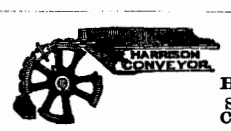


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**Proposals for Materials required for use in the Construction of the U. S. Monitor "Monadnock."**—NAVY DEPARTMENT, Washington, *December* 12, 1888. Sealed proposals, in duplicate, will be received at this Department until 12 o'clock noon, on Wednesday, the 23d day of January, 1889, at which time and place they will be opened in the presence of attending bidders, for furnishing the materials required, under the Bureau of Construction and Repair, for use in the construction of said Monitor, and for the delivery of the same at such place or places within the Navy Yard, Mare Island, Cal., as the Commandant of that Yard may direct. Printed schedules of the materials required, arranged in classes and particularly described, blank forms on which proposals must be made, and all other information essential to bidders, can be obtained by regular dealers in, or manufacturers of, the materials required, on application to the Commandant of said Navy Yard, or to the Chief of the Bureau of Construction and Repair, Navy Department. Proposals may be made for one or more of the classes as designated in the schedule, but no bid for a portion of any class will be considered. Proposals must be inclosed in sealed envelopes marked "Proposals for Materials for the U. S. Monitor 'Monadnock.'" and addressed to the Secretary of the Navy, Navy Department, Washington, D. C. The Secretary of the Navy reserves the right to waive defects in form and to reject any or all bids, as, in his judgment, the interests of the Government may require.
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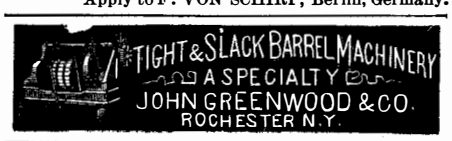


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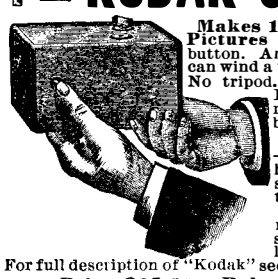

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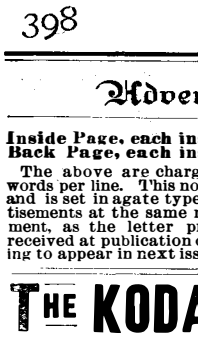

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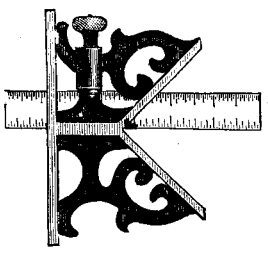

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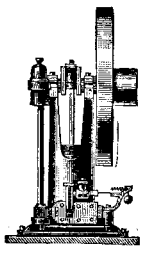

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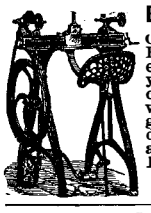

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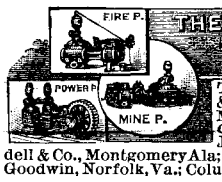


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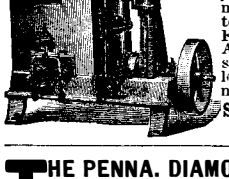

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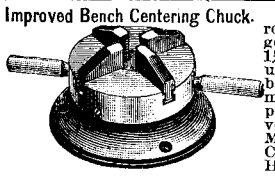

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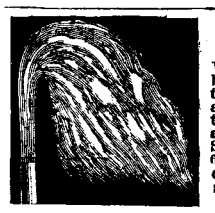

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